A new life table for Glasgow : based on the mortality of the ten years 1881-90 / by Arch. K. Chalmers.

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With

Dr. Chalmers' Compliments.

A NEW LIFE TABLE FOR GLASGOW.

A NEW LIFE TABLE FOR GLASGOW

BASED ON THE MORTALITY OF THE TEN YEARS 1881-90

BY

ARCH. K. CHALMERS,
M.D., D.P.H. CANTAB.,
One of the Medical Officers of Health for the City of Glasgow.

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PREFACE.

The present Life Table is now the third of its kind which has been prepared for the population of Glasgow during the present century. In this respect the experience of the City is an unique one, and the explanation of it is to be found in an early appreciation, on the part of the Municipal Authorities, of the advantages to be derived from accurate and precise records of the movements of the population.

Early in the century, while, as yet, public hygiene, as a branch of the general science of medicine, existed but in rudimentary form, and before the conception that vital statistics would supply reliable data, from which advances might be made toward the repression of disease, can be said to have acquired any definite expression, these records of population were being compiled for the City. In the third and fourth decades, they were utilised for purposes similar to that which has now been completed for the ninth decade of the century, and the contrasts which these several Tables present, supply invaluable indications of the vital history of Glasgow during the years which lie between.

It is now considerably over a year since the work of constructing the present Table was begun, and it will readily be understood that it could by no means be carried on in a continuous manner consistent with the attention which other duties of the Department demanded. The interruptions were of necessity not only frequent, but, on many occasions, prolonged,

so that the work of picking up the broken connections not infrequently made extensive demands both on time and patience. From beginning to end, however, I have had the valuable and cordial co-operation of Mr. Samuel Elborn, Statistical Clerk to the Department, and if the following pages add anything of importance to the vital history of Glasgow, it is but justice to Mr. Elborn that his share in the labour should have this acknowledgment.

ARCH. K. CHALMERS.

SANITARY CHAMBERS,
GLASGOW, *September 1894.*

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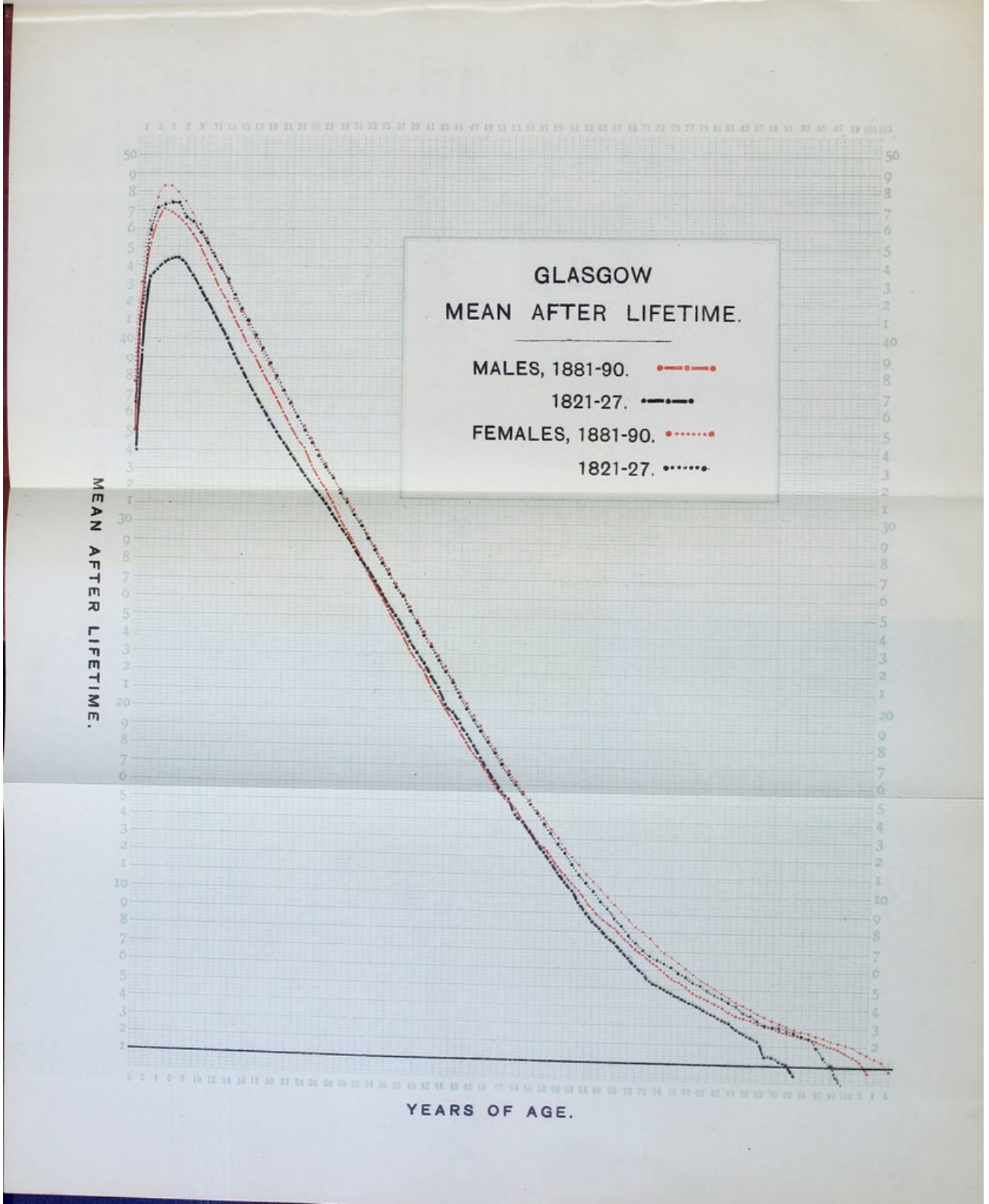
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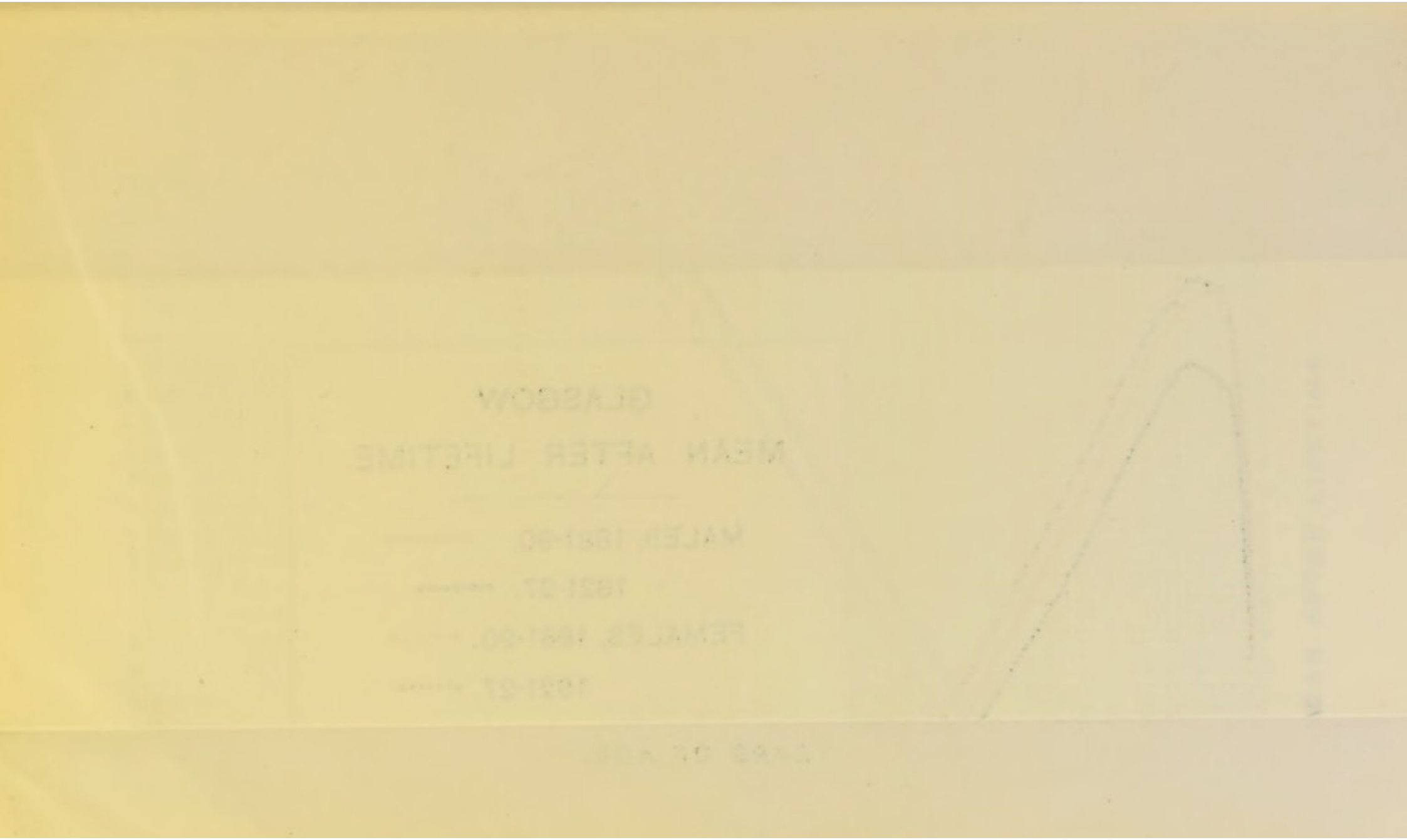

GLASGOW LIFE TABLE.

In the construction of a Life Table an endeavour is made to supply a standard by which the duration of human life may be measured. For this purpose a knowledge of two sets of facts is necessary. In the first place, we must know the number and age of persons constantly living through a given period—that is, we must know the mean population whose combined lives constitute those at risk during it; and we must also know the number and age of those dying in it.

In applying the principles of Life Table construction to the purposes of Life Insurance, the persons constituting these lives at risk are largely those of a selected class—selected, that is, by medical examination, and constituting a class of healthy lives. To this class no one who is the subject of recognisable disease is admitted; and, in like manner, the deaths which occur will only be of those, who, at one period of life, had attained a definable standard of healthy living. But many lives never reach this standard, yet a place must be found for them if we are to represent accurately their effect on the average vitality of a population. That is, the whole population and all the deaths must form the basis of our calculation, if we are to estimate the average probable duration of life for the individual.

The relation between a population, and the deaths occurring in it, is usually expressed as a ratio per 1,000 living at all ages. This is known as the crude, or general, death-rate, but we shall afterwards see that there

exists a very unequal incidence of deaths at different ages, and that error obviously underlies any comparison of these crude death-rates of populations when this element of varying age-constitution of the population is not taken into account. The same remark applies to varying sex constitution; but, for the present, it will be sufficient to remember, that a rate of mortality may be taken to represent the resultant of the forces acting on a population, and tending either to shorten or prolong life; and, further, that if for the death-rate per 1,000 of the population we can substitute the death-rate per unit of *the living at each year of life*, this will then represent the final result of all the forces which are conventionally included in such phrases as vitality and environment—*i.e.*, it will represent the initial inherent vital force in the individual as influenced by the external conditions which tend to foster or repress it.

In this aspect, therefore, the Life Table of a population becomes an index to its vitality, and at the same time a reflex of the hygienic conditions under which it lives; from which it follows that any estimate of the average expectation of life in a population can only be strictly true of the period from which the observed facts, on which it is founded, are derived, or, at all events, true only for periods in which identical rates of mortality hold good. For the units in the calculation are vital factors, capable individually of expansion or contraction—capable, that is, of having their lives shortened or prolonged by whatever conditions are favourable to the one result or to the other; and if the rate at which persons are dying in any year of life can be reduced, the number surviving will be correspondingly increased, and the total number of years lived by a generation will be greater. When we have ascertained these latter, their distribution among the individuals contained in a generation is simple, for, if by the total number of years lived by a generation we mean the sum of all the years of the individual lives, we are in possession of a number which is, by hypothesis, divisible among all those composing the generation, so that the average will represent the possible lifetime attainable by each, quite irrespective of the actual duration of life in the individual. In other words, we will have stated, that, in a generation living under the rates of mortality known to exist, the number of years lived collectively will number so many, and that this number, distributed among the generation as it enters life, will represent, for that population, the average expectation of individual life at birth.

Further, if we follow this generation from birth onward through all the years which it lives, we shall find the number of survivors becoming year by year fewer until the point of final extinction of the generation is reached. And the rate at which this reduction goes on will be the death-rate which obtains in each year of life.

The population and the deaths used in the construction of these tables are those of Old Glasgow during its last decade. The area of the city was then 6,111 acres, with a density of 93 persons per acre. But by the extension of the boundaries in 1891, much of what formerly had contained the overflow of its population became a substantive part of the parent city. By it 5,750 acres were added to its area, and 92,363 persons to its population, and the density was reduced to 56 persons per acre.*

It was necessary, however, to restrict the enquiry to the population contained within the older area, because such particulars as were required regarding the age distribution of those living in 1881, and dying, during the decennium, in the area added in 1891, were not available. In 1892 the death-rate of Old Glasgow was 23·6 per 1,000 living, against 22·8 for Greater Glasgow, and in 1893 the rates were respectively 23·9 and 23·3. While the mean difference, therefore, of these rates is only ·7 per 1,000 of the population living, it represents a difference in the total number of deaths occurring annually of little under 500 on the present estimate of the population. As a measure of vitality, therefore, the probability of life as given in the appended Tables is *slightly less favourable* than the mortality rates of 1892-93 indicate.

CONSTRUCTION OF TABLE.

The present table is constructed on the basis of the census enumerations of 1881 and 1891, and on the deaths recorded during the 10 years—1881-90.

According to the census, the numbers and age distribution of the population in 1881 and 1891 were as follows:—

*See "Report on Census, 1891, Old and Greater Glasgow," by Dr. James B. Russell, p. 35.

TABLE I.—Census Population—Old Glasgow.

Age.	1881.		
	Males.	Females.	Persons.
Under 5	35,183	34,878	70,061
Over 5	28,439	28,405	56,844
10	24,744	25,182	49,926
15	25,904	26,645	52,549
20	26,959	27,045	54,004
25	23,451	23,092	46,543
30	18,630	18,661	37,291
35	15,340	16,612	31,952
40	13,721	15,446	29,167
45	10,483	12,245	22,728
50	8,971	10,767	19,738
55	5,907	7,652	13,559
60	5,080	7,250	12,330
65	2,731	4,080	6,811
70	1,684	2,790	4,474
75	749	1,377	2,126
80	293	654	947
85	73	204	277
90	16	53	69
95	5	10	15
100	3	1	4
All Ages,	248,366	263,049	511,415

Age.	1891.		
	Males.	Females.	Persons.
Under 5	36,376	36,259	72,635
Over 5	31,746	31,411	63,157
10	29,311	29,455	58,766
15	28,343	29,142	57,485
20	28,914	28,387	57,301
25	25,240	25,929	51,169
30	21,708	21,260	42,968
35	18,226	17,857	36,083
40	15,464	15,704	31,168
45	12,780	13,926	26,706
50	10,511	12,015	22,526
55	6,870	8,506	15,376
60	5,782	7,586	13,368
65	3,208	4,667	7,875
70	2,067	3,295	5,362
75	811	1,622	2,433
80	343	741	1,084
85	74	228	302
90	18	42	60
95	5	8	13
100	1	1	2
All Ages,	277,798	288,041	565,839

The deaths which occurred during the 10 years 1881-90, are shown in Table II. Inasmuch as there occurs annually in Glasgow a number of deaths, which are the result of accident or disease, in persons who reside beyond its boundaries but are removed within them for hospital treatment, and, moreover, as till the last extension of the city, in November, 1891, many pauper deaths, belonging to Glasgow, were registered as occurring in districts outwith the city, certain corrections for those institutional deaths, as they are called, require to be made. The deaths, as thus corrected, are also shown in Table II.; and it will be seen that, in both sexes, the changes produced by these corrections add to the number of deaths occurring at the extremes of life—that is, at the age-periods which have normally a high death-rate—and reduce the numbers dying in the middle periods of life, when the death-rates are normally low. The combined effect of these changes is to reduce the total number of deaths, properly belonging to Glasgow, from 131,405 to 130,547, or a difference of 858; 1,094 being deducted from the male deaths, and 236 added to those of females.

[Table II.

TABLE II.—GLASGOW—REGISTERED AND CORRECTED DEATHS DURING 1881-90.

Ages.	MALES.			
	Registered Deaths.	Corrected Deaths.	Difference.	
			−	+
0—	15,972	16,030	...	58
1—	7,910	7,933	...	23
2—	3,454	3,450	4	...
3—	2,116	2,106	10	...
4—	1,332	1,317	15	..
5—	3,253	3,194	59	...
10—	1,567	1,482	85	...
15—	2,125	1,959	166	...
20—	2,397	2,210	187	...
25—	4,486	4,143	343	...
35—	5,079	4,769	310	...
45—	5,778	5,624	154	...
55—	5,407	5,388	19	...
65—	3,934	4,057	...	123
75—	1,593	1,636	...	43
85—	226	237	...	11
95—	18	18	...	...
All ages,	66,647	65,553	1,094	...

30,836

Ages.	FEMALES.			
	Registered Deaths.	Corrected Deaths.	Difference.	
			−	+
0—	12,972	12,964	...	37
1—	7,256	7,277	...	21
2—	3,308	3,300	8	...
3—	1,992	1,970	22	...
4—	1,331	1,328	3	...
5—	3,071	3,024	47	...
10—	1,478	1,449	29	..
20—	2,032	1,982	50	...
25—	2,533	2,475	58	...
30—	4,955	4,869	86	...
35—	4,688	4,671	17	...
45—	5,222	5,251	...	29
55—	5,801	5,940	...	139
65—	4,976	5,179	...	203
75—	2,593	2,704	...	111
85—	565	581	...	16
95—	30	30	...	...
All ages,	64,758	64,994	...	236

26,839

We are thus in possession of the population as recorded in April, 1881 and 1891, and of the deaths which occurred during the 10 years—January, 1881, to December, 1890—corrected as just stated. But before any comparison of these can be made, the population must be ascertained for a period, which will accurately correspond with that, in which the deaths occurred.

If details as to the ages at which deaths occur were supplied in the Registrar-General's quarterly returns, the simpler method of producing this correspondence would be to replace the deaths occurring in the first three months of 1881 by those occurring during January-March, 1891. But as these details are not available, the population must be dealt with, and an estimate made of the numbers living at the beginning of each of the years in which the census was taken.

According to the census of 1881—

The Males numbered - - - - - -	248,366
and the Females - - - - - - -	263,049
Total population, - -	511,415

At the Census of 1891—

The Males numbered - - - - - -	277,798
and the Females - - - - - - -	288,041
Total, - - - - -	565,839

that is, the population during the 10 years—April, 1881, to April, 1891—increased from 511,415 to 565,839, and it is required to find the rate of quarterly increase which obtained throughout the decennium. In doing so, it is assumed that the rate of increase which obtained during the intercensal period is true of the three months preceding it. Proceeding first to find the *annual* rate of increase, "If p denotes the population at any time, and p^1 the population at any previous time, and n the number of years between, then $\sqrt[n]{\frac{p}{p^1}} = r = 1 +$ the annual ratio of increase."*

As n here represents 10 years, the *annual* rate of increase will be represented by the *tenth* root of the decennial rate, and the *quarterly* rate of increase in turn by the *fourth* root of the annual rate. Applying this formula, in succession, to each of the census populations of 1881 and 1891,

* "Vital Statistics: A Memorial volume of Wm. Farr, M.D.," &c., by Noel A. Humphreys, p. 19.

we have found that the population in the beginning of January, 1881, amounted to 510,123, and, at the beginning of January, 1891, it had increased to 564,410.

The increase thus ascertained in the population in the 10 years beginning January, 1881, is 54,287. The total births in the same period were—

Males, - - - - -	100,649
Females, - - - - -	95,802
Total, - - - -	196,451

and the deaths—

Male and Female were - -	130,547
Excess of births over deaths =	65,904

which would represent the natural increase in the period. But as we have seen the actual increase was only 54,287, so that 11,617 have been lost to the population in the time by excess of emigration over immigration.

The numbers living at the various age-periods given in the census have been also dealt with in a manner similar to that which has just been described for the whole population.

The population at the beginning and end of the decennium, for each of the age-periods of life, being now known, it is further necessary, before these can be compared with the deaths occurring at corresponding ages, to arrive at an estimate of the numbers living continuously through the decennium, or, in other words, of the lives at risk during it. Taking, as an example, the *living at all ages*, we find that the arithmetical mean of the population living at the beginning and end of the decennium is $\frac{510,123 + 564,410}{2} = 537,266$, while, if we take the *annual rate of increase* previously ascertained, P, PR^1, PR^2, PR^3, PR^4, would successively represent the population living at the end of each of these years, and the population living in the middle of the period, viz., January, 1886, would be expressed by PR^5 and number 536,580. Dr. Farr, however, has shown, in constructing the English Life Table No. III., that "the true mean population, which, multiplied by the number of years in the period, is equal to the years of life in it, is less than the mean of the population living at the beginning and end of the period, and more than the population living in the middle of the period," and the formula by which this is obtained is expressed by Dr. Tatham in the Manchester Life Table as $\frac{PR - P \times .43429448}{\text{Common logarithm of R}}$.

when PR represents the present, and P the population at some previous period.

By means of this formula we have estimated the mean annual number living at all ages throughout the decade at 536,810. We have already seen that 65,553 males and 64,994 females died during this period, so that $\frac{65,553 + 64,994}{5,368,100}$ represents an average annual death-rate per unit of ·024319 or 24·32 per 1,000 living.

From the mean annual number living, the number of lives at risk during the decennium is obtained by multiplying the number living by the number of years in the period, and the estimated number of these at various age-groups is shown in the following Table III. :—

TABLE III.

ESTIMATED LIVES AT RISK, WITH NUMBER OF DEATHS AND AVERAGE ANNUAL MORTALITY IN VARIOUS AGE-GROUPS.

Age.	MALES.		
	Lives at Risk.	Corrected Deaths.	Average Annual Mortality.
0— 5	357,536	30,836	·08624
5—10	299,859	3,194	·01065
10—15	268,550	1,482	·00552
15—20	270,499	1,959	·00724
20—25	278,824	2,210	·00793
25—35	443·527	4,143	·00934
35—45	312,079	4,769	·01528
45—55	212,232	5,624	·02650
55—65	117,610	5,388	·04581
65—75	48,117	4,057	·08431
75—85	10,945	1,636	·14947
85—95	904	237	·26217
95—	69	18	·26087
All Ages,	2,620,751	65,553	·02501

Age.	FEMALES.		
	Lives at Risk.	Corrected Deaths.	Average Annual Mortality.
0— 5	355,351	26,839	·07552
5—10	298,126	3,024	·01014
10—15	271,604	1,449	·00533
15—20	278,167	1,982	·00713
20—25	276,814	2,475	·00894
25—35	442,863	4,869	·01099
35—45	327,696	4,671	·01425
45—55	243,779	5,251	·02154
55—65	154,609	5,940	·03842
65—75	73,763	5,179	·07021
75—85	21,849	2,704	·12375
85—95	2,628	581	·22108
95—	100	30	·30000
All Ages,	2,747,349	64,994	·02366

From the lives at risk in these various groups of ages, and the deaths occurring at corresponding ages, the annual death-rate for the group is obtained. These group death-rates are also given in Table III. quinquennially till the age of 25, and thereafter in decennial periods.

Table III. illustrates the diversity which underlies a statement of the total deaths per 1,000 of the population, for in every 1,000 male children living in Glasgow under 5 years of age, 86 die annually, while between 10-15 years of age only 5 per 1,000 die; and, in following the mortality down through the various age periods, we reach the ages 65-75 before the rate of mortality in childhood is again approached. In other words, at certain periods of life the tendency to death is greater than at others; and it will further be observed that the death-rate of females is lower than that of males at every age except at 20-35. Of two populations, therefore, *living under similar sanitary conditions*, but not similar in age or sex distribution, that which contains a larger proportionate number of individuals between 5-65, or a larger proportionate number of females at ages other than 20-35, will, of necessity, have a lower death-rate than the other. The age distribution of town populations is usually such as would, under the circumstances described, tend towards a low death-rate, and Glasgow is no exception, as is shown in the following Table, which gives the proportion of males and females in every 100,000 of population in Old Glasgow, Greater Glasgow, and in Scotland :—

[TABLE IV.

TABLE IV.—Proportion of Males and Females in Scotland and in Greater Glasgow (Census 1891) and in Glasgow, 1881-90, at certain periods of life, per 100,000 of Population.

Age.	Males.		
	Scotland. Census 1891.	Greater Glasgow. Census 1891.	Glasgow, 1881-90.
0— 5	13,115	13,051	13,642
5—10	12,443	11,531	11,442
10—15	11,800	10,635	10,247
15—25	19,821	20,627	20,960
25—35	14,112	16,666	16,924
35—45	10,864	12,166	11,908
45—55	8,165	8,348	8,098
55—65	5,412	4,548	4,488
65—75	3,013	1,934	1,836
75—85	1,098	449	417
85—95	151	43	35
95—	6	2	3
	100,000	100,000	100,000

Age.	Females.		
	Scotland. Census 1891.	Greater Glasgow. Census 1891.	Glasgow, 1881-90.
0— 5	11,888	12,332	12,934
5—10	11,324	10,788	10,851
10—15	10,706	10,192	9,886
15—25	19,057	20,345	20,200
25—35	14,830	16,640	16,120
35—45	11,115	11,642	11,927
45—55	8,958	8,855	8,873
55—65	6,355	5,479	5,628
65—75	3,906	2,775	2,685
75—85	1,596	847	796
85—95	254	101	96
95—	11	4	4
	100,000	100,000	100,000

In the construction of a Table which shall show the probability of living through each year of life, it is essential that the death-rate in each year shall be known. In Table III. the death-rates are given for definite age-groups, and if the average mortality of the group could be rightly assumed to represent its central death-rate, that is, the actual rate which obtains in the middle of it, a progression of yearly death-rates could be established from which the probability of living and dying in each year could be calculated.

In the ages 25-35, among the males 934 deaths per 100,000 living occur annually. It will be evident that this number cannot accurately represent the rate which obtains in both the years of life 25-26 and 34-35; does it then represent the death-rate in the middle of the period? that is, is it the rate at which deaths are occurring in the age $29\frac{1}{2}$ to $30\frac{1}{2}$. It is notoriously the case that in children under 5 years of age the average annual mortality of the group is not synonymous with its central death-rate, and in Table II. it is shown, with regard to males, that half the deaths under 5 years occur during the first year of life. At other periods of life, and especially in early adult life, when the changes in the death-rate are slow, the approximation of the average mortality rate of the group to its central death-rate is very close, but in the latter years of life the divergence increases.* The relationship therefore which these group death-rates bear to the several years within the corresponding period is a varying one, and it is necessary to obtain the mortality figure, applicable to each year, by other methods.

Estimate of number living and dying in each year of life.

In Table I. it will have been noticed that, in the census returns of the population, the numbers living are given in groups of ages. The Registrar General's returns of deaths are similarly stated, except for the first quinquennium of life, in which the deaths are stated for each year, while for the first year of life the number of deaths is further divided into those occurring under 3, 6, and 12 months respectively.

Now it is necessary, from the method adopted in constructing this Table, that we arrive at an estimate of the numbers *living and dying in each year of life*, that is the numbers living, say at ages over 5 and under 10, must be so distributed that we shall know how many

* See in this connection a paper by Dr. Farr, "On the construction of Life Tables, illustrated by a new Life Table of the Healthy Districts of England," Transactions of the Royal Society, April, 1859; also Manchester Life Table, p. 9.

of them were living over 5 years of age and under 6, over 6 and under 7, and so on for each year of the period; and in a similar way the deaths for the period must be dealt with, so that we shall know how many occurred during each of the several years contained in it. For each of the ages from 5 years upwards these have been ascertained by interpolation, as will be afterwards described, but during the early years of life the rate of mortality changes so rapidly that serious inaccuracies would arise in thus estimating the yearly population.

If Table II. is referred to it will be seen that 30,836 male deaths occur under 5 years of age, and, as the mean annual population at these ages was 35,753·6, the average annual mortality of the ages 0-5 was ·08624 or 86·24 per 1,000 living. But, of these deaths, 16,030, or more than half, occurred in children under 1 year, so that to obtain an approximation to the numbers living at ages under 1, 2, 3, 4 and 5, it is necessary to have recourse to an estimate based on the deaths registered at each of the individual years of life, and on the births from which these deaths could have occurred.

Estimate of population under 5 years.

The following will help to illustrate the method of arriving at the yearly population living under 5 years of age. Of males, there were born in the 10 years, 1881-90, 100,661, and during the same period there occurred 16,030 deaths of male children under 1 year of age. But a certain number of these deaths occurring in the early months of 1881 would be of children born in 1880, and, in a corresponding manner, some deaths under 1 year, occurring in 1891, would be of births in 1890; so that if we assume that the deaths were equally distributed throughout the year, one-half of the children born during 1880 must be added to, and one-half of those born in 1890 deducted from, the total number born in 1881-90, in order that we may obtain the number out of which the deaths, under 1 year, in the decennium 1881-90 occurred. Thus we have—

Total male births, 1881-90,	- - - -	100,649
Less ½ „ 1890,	- - - -	4,931
		95,718
Plus ½ „ 1880,	- - - -	4,822·5
		100,540·5

as the number born from which these deaths, under 1 year, occurred.

For the numbers living out of which deaths, under 2 years, occurred in the decennium, one-half the births of 1879, all the births of 1880-8, and one-half those of 1889 are taken; and from the total births thus obtained, the deaths, under 1 year, occurring in 1881-90, are deducted. This method is continued for the several decennia, so that in ascertaining the numbers living between 4-5 out of which the deaths at that age occurred, the births, 1876-86, are taken, *plus* ½ those of 1875 and *minus* ½ those of 1886, and the deaths deducted are as follows:—

Deaths	under	1	year	recorded in decennium,	1877-86
,,	,,	2	,,	,,	1878-87
,,	,,	3	,,	,,	1879-88
,,	,,	4	,,	,,	1880-89

The mean annual male population, under 5 years, as calculated from the census returns, was, as is shown in Table II., 35,753, which is much less than the number which would have remained had the reduction of the total births been by death only, and the difference is to be explained by children leaving the population with their parents. These numbers must therefore be further dealt with, and for each of the years, 0, 1, 2, 3, and 4 be brought, in their respective proportions, into line with the mean population derived from the census returns.

The numbers thus resulting are those out of which the yearly deaths occur.

In dealing with the ages from 5 years and upwards, the following method was adopted:—

The figures given in Table III., representing the estimated lives at risk, and the deaths, in various age groups, were reconstructed as in the following table:—

TABLE V.

Lives at Risk, with Deaths occurring at certain Ages and Upwards.

Age.	Males.		Females.	
	At each Age and Upwards.		At each Age and Upwards.	
	Lives at Risk.	Deaths.	Lives at Risk.	Deaths.
0—	2,620,751	65,553	2,747,349	64,994
5—	2,263,215	34,717	2,391,998	38,155
10—	1,963,356	31,523	2,093,872	35,131
15—	1,694,806	30,041	1,822,268	33,682
20—	1,424,307	28,082	1,544,101	31,700
25—	1,145,483	25,872	1,267,287	29,225
35—	701,956	21,729	824,424	24,356
45—	389,877	16,960	496,728	19,685
55—	177,645	11,336	252,949	14,434
65—	60,035	5,948	98,340	8,494
75—	11,918	1,891	24,577	3,315
85—	973	255	2,728	611
95—	69	18	100	30

As thus arranged, each column constitutes a descending series. The logarithms, corresponding to the original terms in each series, were then taken, and each column dealt with separately. The logarithms applicable to each of the intervening years were interpolated by the method of finite differences—series of 8 orders being employed—and the resulting progressions represented the numbers living or dying *at each year of life and upwards.* The *difference* between any two terms was therefore the number living or dying in that particular year.

The probability of living through one year of life in relation to the death-rate of the year.

In considering the relationship which exists between the *number living* in any year of life, the *number of deaths* occurring in it, and the *probability of surviving it*, it is assumed that the number of the living is an "arithmetical mean proportional between the numbers that annually enter upon and that annually complete the year"—*i.e.*, it is less than the number beginning the year by one-half the deaths which occur during it, and greater than the number surviving it to a like extent, on the assumption of an equal distribution of the deaths throughout it.* In other words, of a given number entering upon any year of life a smaller number will survive it, and the chance of surviving it—chance being here used in its mathematical sense as indicating probability—is the fraction obtained by dividing the survivors by the number entering the particular year.† An illustration will make this plain. The mean annual number of males living under 1 year of age is 8374·8, which gives 83,748 lives at risk in the decennium, and the male deaths under 1 year are, as corrected, 16,030. The average annual mortality per unit for males during the first year of life is, therefore, $\frac{16030}{83748} = \cdot 19141$. By the hypothesis, therefore, $1 + \frac{1}{2}m = (1 + \frac{\cdot 19141}{2}) = 1\cdot 095705$, or the population living at the beginning of the year, and $1 - \frac{1}{2}m = (1 - \frac{\cdot 19141}{2}) = \cdot 904295$, or the population living at the end of the year, so that the fraction $\frac{\cdot 904295}{1\cdot 095705} = \cdot 82531$, and represents the probability for males at birth of living through the first twelve months of life.

In Table 3, appended, will be found the probability, thus calculated, of living one year from each year of life for males and females.

Having ascertained the probability of living one year from each year of life, we are in a position to build up the Tables which are annexed for the whole of life. A population of 100,000 is taken and divided into males and

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* See "Vital Statistics:" A Memorial Volume of William Farr, M.D., by A. Noel Humphreys.

† See "Vital Statistics," by A. Newsholme, M.D., p. 226.

females, according to the proportions found to exist in the births registered during the decennium, so that our Life Table population begins with 51,234 males and 48,766 females. Each sex is dealt with separately. The number born is multiplied by the fraction expressing the probability of living one year from birth, and the number surviving at the end of the first year of life is thus obtained. Taking the males as an example, the following will afford an illustration of the process :—

$$\text{Males born} = 51{,}234 \times {\cdot}82531 = 42{,}284$$

which is the number completing the first year of life. Subtracting this from the number born we have

Born, - - - - - - - -	51,234
Completing first year of life, - - -	42,284
	8,950

which is the number dying before completing their first year. 42,284 children begin their second year, and this number is again multiplied by the fraction expressing the probability of completing it; and, in succession, the survivors of each year are so dealt with until all are extinct. The column l_x in the Tables is thus formed; and d_x or the number dying in each year, is successively the *difference* between the numbers beginning each year of life. The column P_x in Tables 1 and 2 represents the number of years lived in each year of life by the persons living in it. 51,234 males begin the first year of life, but only 42,284 end it. These latter contribute an *equal number of years lived* in the period, but during it 8,950 die. The deaths occurring in the first year of life are very unequally distributed throughout it, and, from the numbers registered as dying under 3, 6, and 12 months respectively, it is estimated that 8,950 children dying in their first year would live collectively 3,586 years, so that this number is added to the 42,284 years of those who survive the period, giving a total of 45,870 years lived in it.

For each of the after years P_x is the geometric mean of the numbers beginning and ending it. Column 4, or Q_x, represents the sum of all the years of life lived at and above each year. 51,234 males born lived collectively 1,802,340 years, so that the average is 35·18 years, which is the expectation of life at birth of males.

In Table 3, as already stated, the probability of living 1 year from each year of age is given, and this Table, also shows the number surviving at each year of age per 100,000 born.

ANALYSIS OF TABLES.

It has already been said that the importance of a Life Table population consists in the facility which it presents for comparing the mortality *per unit* of the population at each year of life. It excludes the fallacies attending inequalities in age and sex distribution, and enables the individual unit to be compared with itself at future times, or with others. It is therefore unimportant what varying number of persons may be living at each age in different populations thus compared.

It is to be regretted that we have not, as yet, any Table for the whole population of Scotland, with which the mortality of our towns and rural districts may be compared. Two valuable Tables for the years under consideration exist, however—the earlier in point of publication being that for Manchester, by Dr. Tatham, late Medical Officer of Health for that city, and now Superintendent of Statistics in the Department of the Registrar-General for England and Wales; the other for Brighton, by Dr. Newsholme, Medical Officer of Health. The conditions of life in Manchester—in that it is a centre of manufacture, with a population numbering little less than our own—render a comparison of these Tables of exceeding interest; although, as Dr. Tatham has explained, owing to the impossibility of obtaining an accurate record of deaths, in the years dealt with, for the area of Manchester as extended in 1890, the population on which the Manchester Table is constructed is not, as had been the original intention, that of the City of Manchester, but of Manchester and certain other areas which are partly outwith the Municipal Boundary. In this comparison the form in which Dr. Tatham has expressed his analysis has been largely followed. Dr. Newsholme's Table, on the other hand, well sustains the reputation of Brighton as a health resort, and the contrast which it presents to both cities is important.

In Table VI. the death-rates of age groups obtaining in Glasgow are reproduced in comparison with those of Manchester and Brighton for corresponding years, and with the England and Wales rates during 1881-85.

[TABLE VI.

TABLE VI.—Death-Rates per 1,000 Living at various Periods of Life—Glasgow, Manchester, and Brighton, 1881-90; and England and Wales, 1881-85.

Age.	Males.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1881-85.
0— 5	86·24	83·96	64·21	59·6
5—10	10·65	7·62	4·83	5·8
10—15	5·52	3·71	2·30	3·2
15—20	7·24	5·45	4·13	4·6
20—25	7·93	6·95	5·05	6·0
25—35	9·34	11·03	7·72	8·2
35—45	15·28	19·55	12·94	12·7
45—55	26·50	31·14	21·17	19·4
55—65	45·81	54·40	33·76	33·6
65—75	84·31	102·66	64·36	68·8
75—85	149·47	182·23	132·29	144·6
85 and upwards	262·08	317·13	293·80	296·4
All Ages,	25·01	26·07	20·24	

Age.	Females.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1881-85.
0— 5	75·52	70·79	52·59	50·5
5—10	10·14	7·40	4·45	5·6
10—15	5·33	3·69	2·53	3·3
15—20	7·13	4·91	2·92	4·7
20—25	8·94	6·11	3·44	5·9
25—35	10·99	9·50	5·42	7·9
35—45	14·25	15·44	9·01	10·9
45—55	21·54	24·35	14·44	15·2
55—65	38·42	45·62	24·36	27·8
65—75	70·21	87·91	50·93	59·5
75—85	123·75	159·77	121·92	129·4
85 and upwards	223·97	258·33	266·40	267·8
All Ages,	23·66	22·59	15·75	

General Death-Rates—Glasgow, 24·32; Manchester, 24·25; Brighton, 17·65.

The high rate of mortality among children under 5 years of age is well illustrated in this Table, and the excess in Glasgow and Manchester may be regarded as indicating the perils to which child life in large cities is exposed. It is a commonplace of vital statistics that where many children are born many also die, and we have already seen that in Glasgow more than the half of the male deaths under 5 years of age occur before the first anniversary of birth is reached. It would be beside the present purpose to discuss the causes of this, for we should then require to consider with regard to each individual birth the circumstances attending it, the presence of any inherited tendency to disease, or its absence, the food, nursing and housing, as well as the other circumstances which tend to encourage the presence of those diseases which have a special incidence on child life. Much has been done in this and other cities to discover the causes of excessive infant mortality, and for readers interested in this aspect of the question, as it exists in our own city, the various papers by Dr. Russell dealing with it may be referred to with advantage.

All writers in vital statistics are agreed that the vital conditions under which a population lives are best illustrated by a consideration of the following data :—

(1) The probability of living 1 year from each year of life ;

(2) The mean after lifetime or expectation of life ; and

(3) The numbers surviving out of a given number born.

Nos. 1 and 3 for both sexes will be found in Table 3, appended ; No. 2 forms column 5 of Tables 1. and 2.

(1) *The probability of living through one year of life.*—Bearing in mind the intimate nature of the relationship between the death-rate of each year, and the probability of living through it, it would follow that the most crucial test of vitality is afforded by this probability.

From Table 3 of those appended, the probability of living one year at various ages has been taken, and in the following Table, VII., these are shown as compared with Manchester and Brighton in corresponding years, and with England and Wales Tables, according to the rates which obtained during 1871-80.

TABLE VII.—THE PROBABILITY OF LIVING ONE YEAR AT VARIOUS AGES IN GLASGOW, MANCHESTER, AND BRIGHTON, 1881-90, AND IN ENGLAND AND WALES, 1871-80.

Age.	Males.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1871-80.
0	·82531	·80650	·84608	·84142
5	·98417	·98707	·99290	·99011
10	·99455	·99397	·99761	·99176
15	·99347	·99576	·99646	·99608
20	·99219	·99447	·99539	·99374
25	·99187	·99168	·99403	·99227
35	·98831	·98449	·98964	·98873
45	·97920	·97513	·98311	·98340
55	·96469	·95904	·97369	·97332
65	·93675	·92307	·95406	·95114
75	·88267	·85891	·91501	·89839

Age.	Females.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1871-80.
0	·85318	·84169	·87672	·87127
5	·98511	·98635	·99405	·99094
10	·99497	·99397	·99726	·99596
15	·99370	·99604	·99710	·99603
20	·99180	·99495	·99683	·99390
25	·99028	·99255	·99589	·99264
35	·98738	·98732	·99271	·99000
45	·98293	·98096	·98857	·98649
55	·97085	·96646	·98098	·97906
65	·94646	·93538	·96487	·95836
75	·90403	·87615	·91233	·90948

The figures here refer only to the individual year named. At almost every year quoted, the probability in Brighton is greater than in England and Wales, and is much in excess of both Glasgow and Manchester. The probability of living 1 year from birth, and also at 10 years, is greater in Glasgow than in Manchester, both for males and females, but it is less for both at 5, 15, and 20, and for females also at 25. Thereafter, it is constantly greater in Glasgow for both sexes.

(2) *The mean after lifetime, or expectation of life*, is the sum of the years lived at and above a given age, distributed equally among the number entering it. It is, therefore, dependent largely on conditions affecting the population at later ages than that for which it is calculated, and will, in consequence, be raised or lowered by favourable or adverse circumstances affecting these.

Table VIII. shows this expectation at given ages compared with Manchester, Brighton, and England.

[Table VIII.

TABLE VIII.—Expectation of Life at various Ages—Glasgow, Manchester, and Brighton, 1881-90; England and Wales, 1871-80.

Age.	Males.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1871-80.
0	35·18	34·71	43·59	41·35
5	46·97	45·59	52·87	50·87
10	44·32	42·75	49·12	47·60
15	40·51	38·78	44·67	43·41
20	36·90	34·62	40·55	39·40
25	33·29	30·69	36·51	35·68
35	26·06	23·76	29·02	28·64
45	19·54	17·80	22·36	22·07
55	13·99	12·49	16·48	15·95
65	9·38	8·15	10·96	10·55
75	5·96	5·11	6·64	6·34

Age.	Females.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1871-80.
0	37·70	38·44	49·00	44·62
5	48·27	48·06	56·92	53·08
10	45·44	45·43	53·15	49·76
15	41·59	41·50	49·07	45·63
20	38·00	37·33	44·76	41·66
25	34·60	33·38	40·48	37·98
35	28·06	26·30	32·48	30·90
45	21·61	19·79	25·07	24·06
55	15·60	13·91	18·48	17·33
65	10·69	9·11	12·19	11·42
75	6·97	5·76	6·97	6·87

This Table affords an excellent illustration of what has been said, and should be read with the two preceding Tables. As in Table VII., the figures refer only to the years mentioned. By the Brighton Tables males have at birth an expectation of life of 43·5 years, which is greater than that of Glasgow male births by 8·4 years; and for males who complete their 45th year, there is, by the Brighton rates, a probable after lifetime of 22·3 years, against 19·5 in Glasgow. At each of the years named, males in Glasgow have a greater expectation of life than in Manchester, and for females it is also greater, except at birth.

(3) *Number surviving at certain ages out of a given number born.*—With regard to this it is to be remarked that the possibility of error lies just in the opposite direction to that which has been pointed out, in dealing with the mean after lifetime. The number constantly diminishes from birth, but a large infantile mortality reduces the number reaching later years, quite independently of any adverse circumstances attending these latter.

TABLE IX.—Number Surviving at certain Ages out of 100,000 Born.

Age.	Males.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1871-80.
0	100,000	100,000	100,000	100,000
5	66,870	67,896	75,125	73,407
10	63,550	64,675	73,344	70,899
15	61,799	63,076	72,501	69,642
20	59,610	61,644	71,015	68,003
25	57,288	59,645	69,273	65,708
35	52,148	53,173	64,090	59,886
45	44,653	43,664	56,175	52,237
55	34,061	31,859	45,303	42,468
65	21,211	18,067	32,455	29,716
75	8,711	6,069	16,666	14,496

Age.	Females.			
	Glasgow. 1881-90.	Manchester. 1881-90.	Brighton. 1881-90.	England and Wales. 1871-80.
0	100,000	100,000	100,000	100,000
5	69,992	71,792	78,546	76,262
10	66,865	68,256	76,811	73,838
15	65 109	66,614	75,839	72,496
20	62,831	65,219	74,733	70,795
25	60,108	63,300	73,470	68,486
35	53,802	57,335	69,508	62,884
45	46,597	49,192	63,475	56,017
55	37,441	38,324	54,779	47,744
65	25,156	24,027	42,731	35,617
75	12,074	9,458	25,080	19,057

In this Table it is shown that of 100,000 males born in Glasgow 33,130 die before completing their fifth year, and 47,852 before completing their 35th year; while Table 3, of these appended, show that more than half are dead before completing their 39th year. Of the females born, fully one-half, or 50,300, begin their 41st year, but only 49,610, or less than half of those born, complete it.

Of 100,000 males born, 73,407 completed their 5th year in England and Wales, 67,896 in Manchester, 66,870 in Glasgow—that is, 33,130 died in Glasgow against 26,593 in all England, and 32,104 in Manchester, or an excess of deaths during these years in Glasgow over England and Wales of 6,537, and over Manchester of 1,026. At 15 years of age, the 100,000 born have become 69,642 in all England, 61,779 in Glasgow, and 63,076 in Manchester. In the middle period of adult life, 44,653 of the number survive in Glasgow, as against 43,664 in Manchester, and 52,237 in all England. At 75 there are still 14,496 living in all England, against 6,069 in Manchester and 8,711 in Glasgow.

In the first 5 years of life we have seen that 33,130 die in Glasgow, as compared with 32,104 out of an equal number of male births in Manchester. This decrease takes place in the following manner:—

Probability of Living 1 Year at given ages.			Numbers surviving out of 100,000 born.	
Males.			Males.	
Age.	Glasgow.	Manchester.	Glasgow.	Manchester.
0	·82531	·80650	100,000	100,000
1	·89716	·91116	82,531	80,650
2	·95105	·96317	74,044	73,485
3	·96889	·97582	70,422	70,779
4	·98001	·98304	68,231	69,067
5	·98417	·98707	66,870	67,896

In other words, the number of male lives *saved* in Glasgow, owing to the lower mortality in the first year of life, is sufficiently large to maintain a larger number living, as compared with Manchester, till the third year of

life, although the mortality of Glasgow is greater than that of Manchester in the second year. Pursuing the analysis, we find that of the 67,896 males alive in Manchester at 5 years of age, 4,820 die in the next 10 years, and at the *same rate of decrease* the 66,870 living at 5 years of age in Glasgow should lose by death 4,748 before reaching the age of 15, and 62,122 instead of 61,779 should then survive. But 5,091 deaths take place in Glasgow, or an excess of 343, representing the number of male lives *lost* in excess to Glasgow in the period 5-15 as compared with Manchester.

At the latter age, viz., 15 years, school life has for most children ceased. Inherited disease—disease incidental to child-life, especially in a city population, and that worse danger to child-life, to which so many of our city children are exposed, in the form of parental neglect—have each contributed their share of the 38,221 deaths which occur before the survivors of our 100,000 male births have reached their 15th year. That is, the risks of childhood and school-age have been overcome, how do the survivors fare in the period of adolescence? 61,779 have survived to complete their 15th year in Glasgow, 63,076 in Manchester. In Glasgow 57,288 of that number survive to complete their 25th year, in Manchester 59,645—that is, out of a larger number beginning adolescence in Manchester there are fewer deaths. The deaths in Manchester were 3,431, in Glasgow 4,491; but had the Glasgow deaths occurred at the same rate as in Manchester, we should have had 58,434 surviving to complete their 25th year instead of 57,288. Or, instead of 4,491 deaths, we should only have had 3,345, and 1,146 male lives would have been saved to the community in the period.

Thereafter the probability of living is greater in Glasgow, and the change occurs as is shown in the following Table:—

PROBABILITY OF LIVING 1 YEAR.

MALES.		
Age.	Glasgow.	Manchester.
24	·99198	·99231
25	·99187	·99168
26	·99172	·99103

but the number of lives saved in the earlier years in Manchester maintains a larger number surviving till the age of 40 is reached.

Numbers surviving at certain ages out of 100,000 Born.		
Males.		
Age.	Glasgow.	Manchester.
39	49,536	49,695
40	48,806	48,753
41	48,042	47,785

Table III. shows that the lives at risk during the decennium increased from 540,154 at ages 10-15 to 548,666 at ages 15-20, and to 555,638 at ages 20-25. A population which is regularly recruited from a steady birth-rate, and is not added to by immigration, decreases in the annual number living from birth onwards, so that the number living in any given year is always greater than at any subsequent year of life. An increase, therefore, such as we have just seen can only arise from immigration of persons at the ages in which the increase occurs. It may be assumed that immigrants are in the main healthy, active adults, and, bearing in mind what has already been said regarding the influence of a high death-rate in earlier years on the numbers surviving later in life, the effect produced by the addition of these healthy lives at an age subsequent to childhood is largely lost in a comparison of the numbers surviving out of a given number born. To correct this in the following Table, calculations have been made of the number remaining alive, at the end of given periods of life, out of 1,000 entering them. The number, therefore, in each period is reduced only by the death-rate which obtains during it.

[Table X.

TABLE X.—Number Surviving given Age-periods out of 1,000 Entering them.

Ages.	Males.			
	Glasgow. 1881-90.	Manchester. 1881-90.	England and Wales.	
			1838-54.	1871-80.
0—5	668	679	724	734
5—15	924	929	930	949
15—25	927	946	928	944
25—45	779	732	794	795
45—65	475	414	594	569
Ages.	Females.			
	Glasgow. 1881-90.	Manchester. 1881-90.	England and Wales.	
			1838-54.	1871-80.
0—5	700	718	751	763
5—15	930	928	929	951
15—25	923	950	925	945
25—45	775	777	792	818
45—65	539	488	635	636

This Table may be thus read:—In England and Wales, in 1871-80, of 1,000 entering the period of school age—5-15 years—949 survive to complete it, against 924 in Glasgow and 929 in Manchester; and of 1,000 males, aged 25, in England and Wales, 795 survive to complete their 45th year, against 779 in Glasgow and 732 in Manchester. Of 1,000 men in Glasgow aged 45, 475 survive their 65th year, while in Manchester only 414 complete that age.

It would therefore appear, that the population of Glasgow begins life under heavy disabilities, and that of its childhood, infancy, and youth, a large death toll is exacted. But for those who survive to the age of

maturity these risks have been largely overcome, and the greater expectation of life at birth is largely owing to the extended lifetime of those who reach the most productive period of life. This will be made clearer by the following Table, which shows the proportion of life spent in various age-periods :—

TABLE XI.—PROPORTION OF MEAN LIFETIME PASSED IN VARIOUS AGE-PERIODS.

Life Period.	Length of Period in Years.	Males.		
		Glasgow.	Manchester.	England and Wales. 1871-80.
All Ages,	—	35·18	34·71	41·35
Infancy, 0— 5	5	3·77	3·76	11·09
School Age, 5—15	10	6·38	6·50	
Adolescence, 15—25	10	5·95	6·15	6·84
Maturity, 25—45	20	10·36	10·53	11·49
Maturity, 46—65	20	6·73	6·30	8·60
Decline, 65 and upwards,	—	1·99	1·47	3·31

Life Period.	Length of Period in Years.	Females.		
		Glasgow.	Manchester.	England and Wales. 1871-80.
All Ages,	—	37·70	38·44	44·62
Infancy, 0— 5	5	3·92	3·94	11·51
School Age, 5—15	10	6·72	6·86	
Adolescence, 15—25	10	6·28	6·51	7·10
Maturity, 25—45	20	10·73	11·39	12·02
Maturity, 46—65	20	7·34	7·55	9·62
Decline, 65 and upwards,	—	2·71	2·19	4·37

Comparing the Glasgow figures with those of England and Wales, it is seen that 100 male children born in Glasgow enjoy 3,518 years of life collectively, against 4,135 similarly enjoyed by males born under the England and Wales rates. In Glasgow, 1,015 of these are passed between birth and 15 years of age, against 1,109 in England and Wales; 595 years, as against 684, are similarly spent between the ages 15-25; 1,036, as against 1,149, in the 25-45 period; 673, against 860, between 45 and 65; and only 119, against 330, in the years 65 and upwards. In other words, 100 males born in England and Wales enjoy collectively 617 years of life more than a similar number born in Glasgow; and in the productive period of life, 25-65, they enjoy 300 years more than those born and living under the conditions obtaining in Glasgow.

Compared with Manchester, a similar number born in Glasgow live 47 years more, the excess being almost wholly gained in the years 45 and upwards, for, while only 1 year per 100 lives is gained by Glasgow in the period 0-5 years of life (and this we have previously seen to be due to the lower death-rate in the first year of life), in the ages 5-45 the sum of years lived by 100 of the Manchester population exceeds Glasgow by 49 years, but beyond that age, 95 years longer are enjoyed by the Glasgow population, and $95 + 1 - 49 = 47$, which remain as a gain to the Glasgow population over the whole period of life.

As in a game, the prizes fall to the winners, so, in regard to the expectation of life, the average lifetime of a generation is regarded as being potentially within the reach of every child born, irrespective of disabilities attending individuals. Taking as a standard, the expectation of life at given ages, according to the England and Wales rates of 1871-80, the following Table has been constructed :—

TABLE XII.

EXPECTATION OF LIFE AT VARIOUS AGES, EXPRESSED AS A PERCENTAGE OF THE EXPECTATION AT CORRESPONDING AGES FOR ENGLAND AND WALES, ACCORDING TO THE 1871-80 TABLES.

Ages.	MALES.		FEMALES.	
	Glasgow.	Manchester.	Glasgow.	Manchester.
0	85	84	84	86
5	92	90	91	91
15	93	89	91	91
25	93	86	91	88
46	89	81	90	82
65	89	77	93	80

Assuming the expectation of life of males at birth in England and Wales to be represented by 100, then males at birth in Glasgow have an expectancy of 85, as against 84 in Manchester; at 15 and 25 the Glasgow rate is 93 per cent. of the England and Wales rate, as against 89 and 86 in Manchester. At 45, and again at 65, the Glasgow expectation is 89 per cent. of the All-England, while in Manchester it is 81 and 77 for those ages. Females in Glasgow at all ages, except 5 and 15 enjoy, similarly, an increased relative expectancy as compared with Manchester; but it will be observed that, while the expectation of life for females in Glasgow at each of the ages stated is, as shown in Table VIII., greater than for males, the *ratio* which it bears to the England and Wales rate is less than the male ratio for each age up to 65. In Manchester the female is greater than the male ratio at every age. In other words, the relative expectancy of male life in Glasgow is greater than for females up to the age of 65, whereas in Manchester it is greater for females than for males at every age.

To some extent this Table emphasizes what has been said, in a previous page, regarding the mean after lifetime as a test of sanitary condition. The mean after lifetime, or probable duration of life, corresponds at birth with the

expectation of life. The expectation of life at birth is, for males, 35·18 years, but on completing his 35th year there is a further expectancy of 26·06 years, so that the total expectancy of a male, who has completed his 35th year, is 35·18 + 26·06 or 61·24 years. So much is this expectation of life dependent, not on the conditions affecting the given year for which it is stated, but on the influences affecting later years, that a greater expectancy of life, at a given age, may actually correspond with a greater mortality during it. The death-rate in Manchester for the ages 15-20 is 5·45 per 1,000, against 7·24 in Glasgow, but owing to the lessened mortality, in after years, in Glasgow, the expectation of life at 15 is 93 per cent. of the All-England expectation at the same period, while that of Manchester is only 89.

Dr. Tatham has instituted an interesting comparison of the relative proportions of adult life which are passed during the period of maturity and decline. Assuming that the period of man's most useful and productive work is between the ages 25-65, the period of decline will begin at this latter year. At 25 the expectation of male life, according to Dr. Ogle's Table, for England and Wales in 1871-80 is 35·68, while for Glasgow and Manchester in 1881-90 it was 28·6 and 25·75 respectively. At 65 the probable after lifetime for males, according to the England and Wales Table, is 10·55, and the probability of living 1 year from that age is ·95114. At 65 years of age the Glasgow population has an expectation, however, only of 9·38 years, while in Manchester it is 8·15. In Glasgow ·95114 is slightly greater than the probability of living 1 year at 61, and the expectation of life here, at 62, is 10·65. If we take this latter age, as representing that at which our population is *physiologically as old* as the All-England population at 65, the following Table indicates the relative duration of the periods of maturity and decline :—

TABLE XIII.

EXPECTATION OF LIFE OF MALES AGED 25, DIVIDED INTO PERIODS OF MATURITY AND DECLINE.

	ENGLAND AND WALES. 1871-80.		GLASGOW.	
	Expectation in Years.	Per Cent. of Total Expectation.	Expectation in Years.	Per Cent. of Total Expectation.
Maturity	30·91	87	28·6	86
and				
Decline,	4·77	13	4·69	14
	35·68	100	33·29	100

This Table may be read thus:—All-England males have, at 25 years, an expectation of 35·68 years, 30·91 of which are passed in maturity, and 4·77 in decline, or respectively 87 and 13 per cent. of the total expectation of life at 25. In Glasgow, of the 33·29 years forming the expectation of life at 25, 28·6 years or 86 per cent. is passed in maturity, representing a loss of 2·31 years as compared with the proportion for England; and during the period of decline 4·69 years are passed, as against 4·77. In other words, when thus compared, we lose between 8 and 9 per cent. of the period of maturity, and nearly 2 per cent. of the period of decline.

The yearly changes which take place in the expectation of life are such as lend themselves to graphic representation, and the accompanying chart is constructed on the basis of the probable after lifetime at each year of age. The base line represents the years of age, the ordinates erected on it indicate the expectation of life at each year.

There are two main directions in the movement, an upward one, covering only a few years from birth, and a prolonged downward movement, extending throughout the rest of life.

According to the present rates of mortality, males enter life with an expectation of life slightly over 35 years. For those who survive the first year, the expectation then increases to fully 41 years, and there is a still further gain with the completion of each of the next three years, so that male children, beginning their fifth year, have a mean after lifetime of fully

47 years. Females have a greater expectation of life at every age than males. At birth it is fully 37½ years, and, on the completion of the fourth year of age, it has increased to fully 48 years.

The prolongation of the descent during the later years of life, for both sexes, might seem to suggest a lessening of the rate at which the progress of decay proceeds, during these years, and if Table III. is referred to, it will be found that the average mortality rate for the ages 95 and upwards is slightly less than that of the ages 85-95. But the numbers living at these advanced ages is small, and the information obtainable as to the precise ages of both living and dying may not be reliable.

PREVIOUS LIFE TABLES FOR GLASGOW.

Advantage has been taken of this chart to introduce contrast curves, showing the expectation of life, derived from the rates of mortality, which obtained during several years of the third decade of this century.

In 1829 Mr. James J. Duncan, then Manager of the West of Scotland Insurance Company, now merged in the Scottish Amicable Life Assurance Society, published Tables of the probability and expectation of male and female lives in Glasgow. His estimate of the population was based on the rate of increase ascertained to exist between the years 1801, 1811, and 1821, according to the census enumerations in these years, although some confusion, as between city and suburbs, seems to have crept into the population returned for 1821. In 1826 extensive emigration took place from the city, consequent Mr. Duncan says "on the unusual depression" which existed in that year. Nevertheless, he estimated the population, at the end of 1827, at 180,000 souls, and the requisite information regarding the deaths in the period was obtained from the bills of mortality which were then published annually, under the supervision of Dr. Clelland.

From these data he ascertained the average rates of mortality during the years 1821-7, and the expectation of life at each year, as deduced therefrom, is given in his Table, and is here reproduced in chart form for males and females.

The contrasts presented by these curves sufficiently indicate the changes which have taken place, in the expectation of life, during the intervening years. There is at birth now an increased expectation of life, for each sex, of fully a year. The greatest probable after lifetime by the old rate was 44·46 years for males, and 47·35 years for females, on the completion of the 6th and 5th year of life respectively. At 6 years of age males have

now a probable after lifetime of 46·72 years, while the maximum expectation is, as we have seen, 47·03 years, at 4 years of age. That is an increase of 2·27 years at the age when the probable after lifetime is greatest. For females the change has been less marked. At 5 years of age their expectation of life now, is 48·27 years, as against 47·35 years then, and the maximum, at 4 years now, is 48·29 years, which exceeds by nearly one year the maximum formerly attained.

Mr. Duncan's Tables were based, as has been stated, on an estimate of the population projected 6 years in advance of the census of 1821, because no reliable bills of mortality for the intercensal period, 1811-21, were available. After 1819, however, in these bills the sexes "were distinguished at each age;" and in 1836 Mr. T. R. Edmonds, B.A., contributed an article to the *Lancet* "On the Mortality of Glasgow, and on the Increasing Mortality in England." His observation extends over the years 1821-35, and he states "that the most remarkable feature presented by the present Glasgow observations, is the *rapid and uniform increase in the mortality of adults.*" This remark applies to the whole period he had under review, but by further investigation he was able to compare the changes in the 3 quinquenniads contained in it, and to demonstrate that "in Glasgow the *mortality, under the age of 5 years, had been progressively diminishing until the year 1830, since which time it had rapidly increased.*" His conclusion was that "the rates of mortality for each sex had increased very considerably during the respective periods, 1821-5, 1826-30, and 1831-5."

In an article in the "Encyclopædia Britannica" (7th edition), entitled "Mortality: Human," written by Mr. J. Milne about the year 1835, reference is made to a "Table of Mortality for Glasgow which the author has had by him for several years, and expects to publish soon." It does not appear, however, that he was ever able to carry out this intention; and the form in which his results are expressed in the article referred to does not readily lend itself to comparison with the present Table. *

Between 1831 and 1841 the population of the "City and Suburbs" increased from 202,426 to 274,180. This latter number is given by Mr.

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* There is an exceedingly interesting chapter on the past history of vital statistics in Glasgow in Walford's "Insurance Cyclopædia," Vol. V. It contains much valuable information, which is curiously lost sight of in the current literature of vital statistics, and to it I am indebted for what is here stated regarding the investigations of Mr. Milne and Mr. Edmonds.

Neison as the census enumeration of 1841 ; but Dr. Strang, in his "Report on the Census for 1861," gives 270,486 as the population in 1841 of the "Parliamentary City, including *part* of the old royalty beyond." In 1845 Mr. Neison published his work on "Vital Statistics," and it contains a Mortality Table constructed "for the general population of the City of Glasgow, in order," he says, "to compare the results with the English cities." This Table was founded on the populations as stated by him to exist, according to the census enumerations of 1831 and 1841, and on the mortality bills, for the city, for the ten years 1832-41. In it there is ample evidence that the upward movement in the rates of mortality, which Mr. Edmond found had already begun early in the "twenties," continued beyond the period he had under observation, and Mr. Neison, speaking of his own period, says, "If the *expectation of life* for the City of Glasgow be referred to, the remarkable depreciation in the duration of life there will appear somewhat startling. *No Table of Mortality hitherto published will show anything like so low an estimate.*"

With these words the last Glasgow Life Table comes to a close, and it is interesting to look back over the half century which has elapsed since they were written, and note some of the changes which have taken place in the rates of mortality during it. Some of these are indicated in the following Tables :—

TABLE XIV.

Average Annual Mortality per 1,000 Living at certain Age-groups in Glasgow.

Age.	Males.		Females.	
	1832-41.	1881-90.	1832-41.	1881-90.
Under 5	106·61	86·24	99·29	75·52
5—10	16·76	10·65	15·46	10·14
10—15	7·77	5·52	7·63	5·33
15—20	10·82	7·24	7·78	7·13

TABLE XV.

EXPECTATION OF LIFE AT CERTAIN AGES IN GLASGOW IN 1821-27, 1832-41, AND 1881-90.

Age.	Males.			Females.		
	1821-27.	1832-41.	1881-90.	1821-27.	1832-41.	1881-90.
0	34·12	—	35·18	36·64	—	37·70
10	42·27	37·40	44·32	45·24	39·94	45·44
20	35·13	30·96	36·90	38·07	33·57	38·00
30	29·40	24·90	29·68	31·23	26·90	31·31
40	23·16	19·45	22·67	24·71	21·07	24·82
50	16·86	14·53	16·65	18·31	15·86	18·50
60	11·29	9·89	11·56	12·79	11·10	12·99
70	6·75	5·95	7·51	7·93	6·88	8·69

In Table XV. a column is introduced from Mr. Duncan's Tables, and it should be read in connection with Mr. Edmonds' observations. Looking back over the whole period covered by the three Tables, we see, at the beginning, the population of Glasgow enjoying a measure of vitality little short of the present standard, and it is fair to assume that earlier in the century it was even greater. But between that time and this there is a chasm, and it is probable that Mr. Neison's Table does not represent it at its greatest depth. The tide of industrial immigration, which came as a flood, in the second quarter of the century swamped the city. A rapid increase in the rate of mortality resulted. It is first observed in the adult population, indicating that many of the immigrants were ill fitted to combat the altered conditions of their lives. Soon, however, it tells also on the children. In the fourth decade of the century one death occurs in every 10 male children living under 5 years, and we find the vital conditions which are so forcibly described in the words which I have quoted from Mr. Neison. After 50 years, we have recovered much of the ground thus lost, and the vital conditions of the population now, are on a higher level than when we saw them in Mr. Duncan's Table, just at the time when the descent began.

GLASGOW LIFE TABLE

(Based on the Mortality of the Ten Years, 1881-90).

GLASGOW LIFE TABLE.

Based on the Mortality of Ten Years, 1881-1890.

Table 1.—Males.

Column	1	2	3	4	5
Age. x	Dying in each Year of Age. d_x	Born and Surviving at each Age. l_x	Population or Years of Life lived in each Year of Age. P_x	Years of Life lived in and above each year of Age. Q_x	Expectation of Life at each Year of Age. $E_x = \frac{Q_x}{l_x}$
0	8,950	51,234	45,870	1,802,340	35·18
1	4,348	42,284	40,051	1,756,470	41·54
2	1,856	37,936	36,996	1,716,419	45·25
3	1,122	36,080	35,514	1,679,423	46·55
4	698	34,958	34,607	1,643,909	47·03
5	542	34,260	33,988	1,609,302	46·97
6	408	33,718	33,513	1,575,314	46·72
7	310	33,310	33,155	1,541,801	46·29
8	241	33,000	32,879	1,508,646	45·72
9	200	32,759	32,659	1,475,767	45·05
10	177	32,559	32,470	1,443,108	44·32
11	171	32,382	32,296	1,410,638	43·56
12	173	32,211	32,125	1,378,342	42·79
13	182	32,038	31,947	1,346,217	42·02
14	194	31,856	31,759	1,314,270	41·26
15	207	31,662	31,558	1,282,511	40·51
16	218	31,455	31,346	1,250,953	39·77
17	226	31,237	31,124	1,219,607	39·04
18	234	31,011	30,894	1,188,483	38·34
19	236	30,777	30,659	1,157,589	37·61
20	239	30,541	30,421	1,126,930	36·90
21	238	30,302	30,183	1,096,509	36·19
22	238	30,064	29,944	1,066,326	35·47
23	238	29,826	29,707	1,036,382	34·75
24	237	29,588	29,469	1,006,675	34·02
25	239	29,351	29,231	977,206	33·29
26	241	29,112	28,992	947,975	32·56
27	245	28,871	28,749	918,983	31·83
28	250	28,626	28,501	890,234	31·10
29	257	28,376	28,247	861,733	30·37
30	265	28,119	27,986	833,486	29·68
31	270	27,854	27,719	805,500	28·92
32	279	27,584	27,444	777,781	28·20
33	288	27,305	27,161	750,337	27·48
34	299	27,017	26,867	723,176	26·77
35	313	26,718	26,561	696,309	26·06
36	326	26,405	26,242	669,748	25·36
37	342	26,079	25,907	643,506	24·68
38	357	25,737	25,558	617,599	24·00
39	375	25,380	25,192	592,041	23·33
40	391	25,005	24,809	566,849	22·67
41	409	24,614	24,409	542,040	22·02
42	425	24,205	23,992	517,631	21·39
43	443	23,780	23,557	493,639	20·76
44	459	23,337	23,106	470,082	20·14
45	476	22,878	22,638	446,976	19·54
46	492	22,402	22,154	424,338	18·94
47	508	21,910	21,654	402,184	18·36
48	523	21,402	21,139	380,530	17·78
49	537	20,879	20,609	359,391	17·21
50	551	20,342	20,064	338,782	16·65
51	566	19,791	19,506	318,718	16·10
52	579	19,225	18,933	299,212	15·56
53	591	18,646	18,348	280,279	15·03
54	604	18,055	17,750	261,931	14·51

GLASGOW LIFE TABLE.

Based on the Mortality of Ten Years, 1881-1890.

Table 1.—Males *(Continued).*

Column	1	2	3	4	5
Age.	Dying in each Year of Age.	Born and Surviving at each Age.	Population or Years of Life lived in each Year of Age.	Years of Life lived in and above each Year of Age.	Expectation of Life at each Year of Age.
x	d_x	l_x	P_x	Q_x	$E_x = \frac{Q_x}{l_x}$
55	617	17,451	17,140	244,181	13·99
56	627	16,834	16,518	227,041	13·49
57	639	16,207	15,884	210,523	12·99
58	649	15,568	15,240	194,639	12·50
59	658	14,919	14,586	179,399	12·02
60	667	14,261	13,923	164,813	11·56
61	670	13,594	13,252	150,890	11·10
62	680	12,919	12,575	137,638	10·65
63	685	12,239	11,892	125,063	10·22
64	687	11,554	11,206	113,171	9·79
65	687	10,867	10,518	101,965	9·38
66	685	10,180	9,831	91,447	8·98
67	680	9,495	9,148	81,616	8·59
68	673	8,815	8,472	72,468	8·22
69	660	8,142	7,805	63,996	7·86
70	647	7,482	7,151	56,191	7·51
71	628	6,835	6,513	49,040	7·17
72	607	6,207	5,895	42,527	6·85
73	583	5,600	5,301	36,632	6·54
74	554	5,017	4,732	31,331	6·24
75	524	4,463	4,193	26,599	5·96
76	490	3,939	3,686	22,406	5·69
77	455	3,449	3,213	18,720	5·43
78	419	2,994	2,777	15,507	5·18
79	381	2,575	2,377	12,730	4·94
80	343	2,194	2,015	10,353	4·72
81	305	1,851	1,691	8,338	4·50
82	270	1,546	1,405	6,647	4·29
83	234	1,276	1,153	5,242	4·10
84	201	1,042	930	4,089	3·92
85	171	841	751	3,153	3·75
86	142	670	595	2,402	3·58
87	118	528	465	1,807	3·43
88	96	410	358	1,342	3·28
89	77	314	273	984	3·14
90	61	237	204	711	3·00
91	47	176	151	507	2·87
92	36	129	110	356	2·75
93	27	93	79	246	2·63
94	20	66	55	167	2·52
95	14	46	38	112	2·41
96	10	32	26	74	2·30
97	8	22	18	48	2·18
98	5	14	12	30	2·06
99	3	9	7	18	1·93
100	2	6	5	11	1·76
101	2	4	3	6	1·54
102	1	2	2	3	1·24
103	1	1	1	1	·77
104	...	...	...	...	...
105	...	...	...	...	...
106	...	...	...	...	...
107	...	...	...	...	...
108	...	...	...	...	...
109	...	...	...	...	...

Note.—The figures at the higher ages in Columns 2, 3, and 4 were calculated to two places of decimals. For convenience the nearest whole numbers only are given, but the expectations of life in Column 5 are derived from the more exact values.

GLASGOW LIFE TABLE.

Based on the Mortality of Ten Years, 1881-1890.

Table 2.—Females.

Column	1	2	3	4	5
Age.	Dying in each Year of Age.	Born and Surviving at each Age.	Population or Years of Life lived in each Year of Age.	Years of Life lived in and above each Year of Age.	Expectation of Life at each Age.
x	d_x	l_x	P_x	Q_x	$E_x = \frac{Q_x}{l_x}$
0	7,160	48,766	44,543	1,838,308	37·70
1	3,964	41,606	39,574	1,793,765	43·11
2	1,767	37,642	36,748	1,754,191	46·60
3	1,044	35,875	35,349	1,717,443	47·87
4	699	34,831	34,480	1,682,094	48·29
5	508	34,132	33,877	1,647,614	48·27
6	362	33,624	33,443	1,613,737	47·99
7	267	33,262	33,128	1,580,294	47·51
8	210	32,995	32,890	1,547,166	46·89
9	178	32,785	32,696	1,514,276	46·19
10	164	32,607	32,525	1,481,580	45·44
11	161	32,443	32,623	1,449,055	44·66
12	167	32,282	32,198	1,416,432	43·88
13	176	32,115	32,027	1,384,234	43·10
14	188	31,939	31,845	1,352,207	42·34
15	200	31,751	31,651	1,320,362	41·59
16	212	31,551	31,445	1,288,711	40·85
17	223	31,339	31,227	1,257,266	40·12
18	233	31,116	30,999	1,226,039	39·40
19	243	30,883	30,761	1,195,040	38·59
20	251	30,640	30,514	1,164,279	38·00
21	259	30,389	30,259	1,133,765	37·31
22	266	30,130	29,996	1,103,506	36·62
23	273	29,864	29,727	1,073,510	35·95
24	279	29,591	29,451	1,043,783	35·27
25	285	29,312	29,169	1,014,332	34·60
26	290	29,027	28,882	985,163	33·94
27	296	28,737	28,588	956,281	33·28
28	301	28,441	28,290	927,693	32·62
29	306	28,140	27,986	898,403	31·96
30	310	27,834	27,678	871,417	31·31
31	316	27,524	27,365	843,739	30·66
32	319	27,208	27,048	816,374	30·01
33	324	26,889	26,726	789,326	29·37
34	328	26,565	26,400	762,600	28·71
35	331	26,237	26,071	736,200	28·06
36	335	25,906	25,738	710,129	27·41
37	338	25,571	25,401	684,391	26·77
38	343	25,233	25,061	658,990	26·12
39	346	24,890	24,717	633,929	25·47
40	351	24,544	24,368	609,212	24·82
41	357	24,193	24,014	584,844	24·17
42	363	23,836	23,653	560,830	23·53
43	371	23,473	23,287	537,177	22·88
44	378	23,102	22,912	513,890	22·24
45	388	22,724	22,529	490,978	21·61
46	398	22,336	22,136	468,449	20·97
47	410	21,938	21,732	446,313	20·34
48	422	21,528	21,316	424,581	19·72
49	436	21,106	20,887	403,265	19·11
50	451	20,670	20,443	382,378	18·50
51	465	20,219	19,985	361,935	17·90
52	482	19,754	19,511	341,950	17·32
53	498	19,272	19,021	322,439	16·73
54	515	18,774	18,514	303,418	16·16

GLASGOW LIFE TABLE.

Based on the Mortality of Ten Years, 1881-1890.

Table 2.—Females *(Continued)*.

Column	1	2	3	4	5
Age.	Dying in each Year of Age.	Born and Surviving at each Age.	Population or Years of Life lived in each Year of Age.	Years of Life lived in and above each Year of Age.	Expectation of Life at each Age.
x	d_x	l_x	P_x	Q_x	$E_x = \frac{Q_x}{l_x}$
55	533	18,259	17,990	284,904	15·60
56	549	17,726	17,450	266,914	15·06
57	565	17,177	16,892	249,464	14·52
58	582	16,612	16,318	232,572	14·00
59	597	16,030	15,729	216,254	13·49
60	611	15,433	15,124	200,525	12·99
61	624	14,822	14,507	185,401	12·51
62	635	14,198	13,877	170,894	12·04
63	644	13,563	13,237	157,017	11·58
64	651	12,919	12,589	143,780	11·13
65	657	12,268	11,935	131,119	10·69
66	660	11,611	11,276	119,184	10·26
67	660	10,951	10,616	107,908	9·85
68	658	10,291	9,957	97,292	9·45
69	652	9,633	9,301	87,335	9·07
70	645	8,981	8,652	78,034	8·69
71	635	8,336	8,012	69,382	8·32
72	621	7,701	7,384	61,370	7·97
73	605	7,080	6,770	53,986	7·62
74	587	6,475	6,174	47,216	7·29
75	565	5,888	5,598	41,042	6·97
76	541	5,323	5,045	35,444	6·66
77	515	4,782	4,517	30,399	6·36
78	488	4,267	4,015	25,882	6·07
79	457	3,779	3,543	21,867	5·79
80	426	3,322	3,102	18,324	5·52
81	393	2,896	2,692	15,222	5·26
82	360	2,503	2,316	12,530	5·01
83	327	2,143	1,973	10,214	4·77
84	293	1,816	1,663	8,241	4·54
85	260	1,523	1,387	6,578	4·32
86	228	1,263	1,143	5,191	4·11
87	198	1,035	931	4,048	3·91
88	168	837	748	3,117	3·72
89	143	669	593	2,369	3·54
90	118	526	464	1,776	3·38
91	96	408	357	1,312	3·21
92	78	312	270	955	3·06
93	61	234	202	685	2·92
94	47	173	148	483	2·79
95	36	126	106	335	2·66
96	27	90	75	229	2·55
97	19	63	53	154	2·43
98	14	44	36	101	2·33
99	10	30	24	65	2·22
100	7	20	16	41	2·11
101	5	13	10	25	2·00
102	3	8	7	15	1·84
103	2	5	4	8	1·71
104	1	3	2	4	1·51
105	1	2	1	2	1·21
106	1	1	1	...	·76
107	...	...	...	...	...
108	...	...	...	...	...
109	...	...	...	...	...

Note.—The figures at the higher ages in Columns 2, 3, and 4 were calculated to two places of decimals. For convenience the nearest whole numbers only are given, but the expectations of life in Column 5 are derived from the more exact values.

GLASGOW LIFE TABLE.

Based on the Mortality in Ten Years, 1881-1890.

Table 3.—Males and Females.

Age. x	Chance of Living One Year from each Age. p_x		The Number Surviving at each Age out of 100,000 born.	
	Males.	Females.	Males.	Females.
0	·82,531	·85,318	100,000	100,000
1	·89,716	·90,471	82,531	85,318
2	·95,105	·95,307	74,044	77,188
3	·96,889	·97,088	70,422	73,566
4	·98,001	·97,995	68,231	71,424
5	·98,417	·98,511	66,870	69,992
6	·98,790	·98,924	65,811	68,950
7	·99,071	·99,196	65,015	68,207
8	·99,267	·99,365	64,411	67,659
9	·99,391	·99,458	63,939	67,229
10	·99,455	·99,497	63,550	66,865
11	·99,475	·99,502	63,203	66,529
12	·99,463	·99,483	62,871	66,197
13	·99,431	·99,451	62,533	65,855
14	·99,390	·99,412	62,178	65,494
15	·99,347	·99,370	61,799	65,109
16	·99,307	·99,328	61,395	64,699
17	·99,274	·99,288	60,970	64,264
18	·99,248	·99,250	60,527	63,807
19	·99,231	·99,214	60,072	63,328
20	·99,219	·99,180	59,610	62,831
21	·99,213	·99,148	59,145	62,315
22	·99,208	·99,117	58,679	61,784
23	·99,204	·99,087	58,215	61,239
24	·99,198	·99,057	57,751	60,680
25	·99,187	·99,028	57,288	60,108
26	·99,172	·98,999	56,822	59,523
27	·99,152	·98,970	56,352	58,928
28	·99,125	·98,942	55,873	58,321
29	·99,094	·98,913	55,385	57,703
30	·99,059	·98,885	54,883	57,076
31	·99,028	·98,855	54,867	56,440
32	·98,991	·98,825	53,838	55,794
33	·98,945	·98,796	53,295	55,138
34	·98,892	·98,767	52,733	54,474
35	·98,831	·98,738	52,148	53,802
36	·98,764	·98,708	51,539	53,123
37	·98,690	·98,677	50,901	52,436
38	·98,610	·98,644	50,235	51,742
39	·98,525	·98,608	49,536	51,041
40	·98,435	·98,569	48,806	50,330
41	·98,340	·98,525	48,042	49,610
42	·98,241	·98,476	47,245	48,878
43	·98,138	·98,422	46,414	48,133
44	·98,031	·98,361	45,550	47,374
45	·97,920	·98,293	44,653	46,597
46	·97,804	·98,217	43,724	45,802
47	·97,683	·98,132	42,764	44,985
48	·97,558	·98,039	41,773	44,145
49	·97,426	·97,935	40,753	43,279
50	·97,288	·97,821	39,704	42,386
51	·97,143	·97,697	38,627	41,462
52	·96,990	·97,561	37,524	40,507
53	·96,827	·97,414	36,394	39,519
54	·96,654	·97,256	35,240	38,498

GLASGOW LIFE TABLE.

Based on the Mortality in Ten Years, 1881-1890.

Table 3.—Males and Females *(Continued).*

Age. x	Chance of Living One year from each Age. p_x		The Number Surviving at each Age out of 100,000 born.	
	Males.	Females.	Males.	Females.
55	·96,469	·97,085	34,061	37,441
56	·96,272	·96,902	32,858	36,350
57	·96,060	·96,707	31,633	35,224
58	·95,832	·96,498	30,380	34,064
59	·95,587	·96,276	29,120	32,871
60	·95,323	·96,041	27,835	31,647
61	·95,039	·95,792	26,533	30,394
62	·94,734	·95,529	25,217	29,115
63	·94,405	·95,250	23,889	27,813
64	·94,053	·94,956	22,552	26,492
65	·93,675	·94,646	21,211	25,156
66	·93,270	·94,319	19,869	23,809
67	·92,837	·93,973	18,532	22,456
68	·92,373	·93,609	17,205	21,595
69	·91,883	·93,224	15,893	19,754
70	·91,360	·92,817	14,603	18,416
71	·90,806	·92,388	13,341	17,093
72	·90,220	·91,933	12,115	15,792
73	·89,602	·91,452	10,930	14,518
74	·88,951	·90,942	9,793	13,277
75	·88,267	·90,403	8,711	12,074
76	·87,551	·89,831	7,689	10,916
77	·86,802	·89,224	6,732	9,805
78	·86,020	·88,582	5,843	8,749
79	·85,207	·87,901	5,026	7,750
80	·84,363	·87,179	4,283	6,812
81	·83,489	·86,417	3,613	5,939
82	·82,585	·85,611	3,017	5,132
83	·81,652	·84,761	2,491	4,394
84	·80,692	·83,866	2,034	3,724
85	·79,706	·82,925	1,641	3,123
86	·78,695	·81,939	1,308	2,590
87	·77,660	·80,909	1,030	2,122
88	·76,603	·79,836	800	1,721
89	·75,525	·78,722	612	1,371
90	·74,428	·77,571	462	1,079
91	·73,314	·76,386	344	837
92	·72,183	·75,172	252	639
93	·71,037	·73,935	182	481
94	·69,878	·72,683	129	356
95	·68,708	·71,423	90	258
96	·67,528	·70,165	62	184
97	·66,339	·68,920	42	129
98	·65,143	·67,099	28	89
99	·63,942	·66,516	18	60
100	·62,736	·65,385	12	40
101	·61,527	·64,106	7	26
102	·60,316	·62,809	4	16
103	·59,105	·61,494	2	10
104	·57,895	·60,166	1	7
105	...	·58,825	0	4
106	...	...	...	2
107	...	...	..	1
108	...	...	...	...
109	...	...	...	...