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CANADIAN

ABRIDGED LIFE TABLES

1871, 1881, 1921, 1931

By
M. C. MacLean, A.M.

OTTAWA
1939

Preface

The present bulletin consists of eight abridged life tables, for males and females, covering the years 1871, 1881, 1921 (Registration Area) and 1931 (Canada, excluding Yukon and Northwest Territories). The areas used are not strictly comparable throughout, as for both 1871 and 1881 the data cover only the provinces of Nova Scotia, New Brunswick, Quebec and Ontario.

The Censuses of 1871 and 1881 reported the number and ages of persons dying during the census year. This, of course, was long prior to the National System of Vital Statistics, and some doubts existed as to the completeness of the data by age categories. The need for life tables for this period, however, was so great that it was deemed advisable to bring the data under close examination. As will be seen in the introductory matter in this bulletin the suspected incompleteness yielded to careful analysis. The consistency of the comparison between the sexes in the 1871 and 1881 data on the one hand, and in the 1921 and 1931 data on the other, offered further corroboration of reliability in the earlier years.

The tables were prepared by C. E. Kraemer of the Social Analysis Branch under the general direction of M. C. MacLean.

R. H. Coats.

Dominion Bureau of Statistics,
October, 1939.

Abridged Life Tables

Introduction

Data - The life tables given in the present report for 1871 and 1881, constructed for males and females, are based on the population of four provinces, Ontario, Quebec, New Brunswick and Nova Scotia, since the deaths are available for these provinces only. The population exposed was 3,689,257 or 94.5 p.c. of the total population of Canada in 1871, and 4,044,060 or 93.5 p.c. of the total population of Canada in 1881. A comparison with the tables of 1921 and 1931 can thus be made with assurance that most of the population of Canada has been exposed in the calculation of the tables. The population and deaths of 1921 are for the Registration Area, Quebec being omitted.

Grouping - The ages of the population in 1871 and the deaths of 1871 and 1881 are given in groups of varying sizes. In 1871 the population is given in five-year groups, 6-11, 11-16, etc., till age 20, and in ten-year groups, 21-31, 31-41, etc., thereafter. The deaths are given in five-, ten-, and twenty-year groups in 1871 and 1881 (see Table A of the Appendix).

In order to break up the ten- and twenty-year groups, formula (1) given at the end of the Introduction, a standard formula for bisection of an interval, was applied. The grouping is now in the form, 21-26, 26-31, etc. It was then necessary to put each group back one year, i.e., to 20-25, 25-29, etc., making the groups comparable with those of 1921 and 1931. This was done by applying formula (2) to the age groups.

Adjustment for 1871 and 1881 - In charting the q_x's (the probability of dying in a year), it was found that at age 82 there occurred a sudden dip. No reasonable explanation could be given for such behaviour other than understatement of deaths in the age groups 61-81, and 81-101. In order to ascertain whether such understatement had occurred, an examination was made of the deaths in the census subdistricts. It was thought that, if deaths were understated

because of under-enumeration, the under-enumeration would occur in some districts rather than in all because there would seem to be no good reason why it should occur everywhere. In a few districts no deaths were reported at these ages, in others the reported deaths were far below the average death rate. Giving these districts the same rate as in the remaining districts, an additional 144 male deaths were estimated for 1871, and 167 for 1881; 146 female deaths for 1871, and 152 for 1881.

Due to the broadness of the age groups, it was impossible to point to any particular year or years in which the understatement might occur. By assuming the largest concentration of error to be in the ages 80-89, 120 male and 100 female deaths were added to the age group 80-84 and 24 male deaths and 46 female deaths to the age group 85-89 for 1871. For 1881, 142 male deaths and 152 female deaths were added to age group 80-84, and 25 male deaths and 60 female deaths to group 85-89. The result was a smoothing out of the curve from age 77 to 87 through a remedying of the only apparent cause of the irregular behaviour, i.e., understatement of deaths.

'Not Stated' Ages - The 'not stated' ages among the deaths are a larger proportion than the 'not stated' ages among the population. In order to avoid an error of understatement in the mortality rates a factor was applied to the q_x's distributing the 'not stated' among the age groups.

Comparison with Life Table, 1921 - Comparing the probable death rates for the three years, Charts 1 and 2 show higher rates for 1871 and 1881 from age 7 to 50, after which 1921 is above both 1871 and 1881 up to age 87. The question why 1921 should be above the other two years at the later ages arises. Is it due to further understatement of deaths in the early censuses?

The additional deaths required to raise the rates of 1871 and 1881 up to the level of 1921 were calculated for males. It was found that 1,092 deaths were needed in 1871 and 1,268 in 1881, i.e., understatements of 21.6 p.c.

CHART I

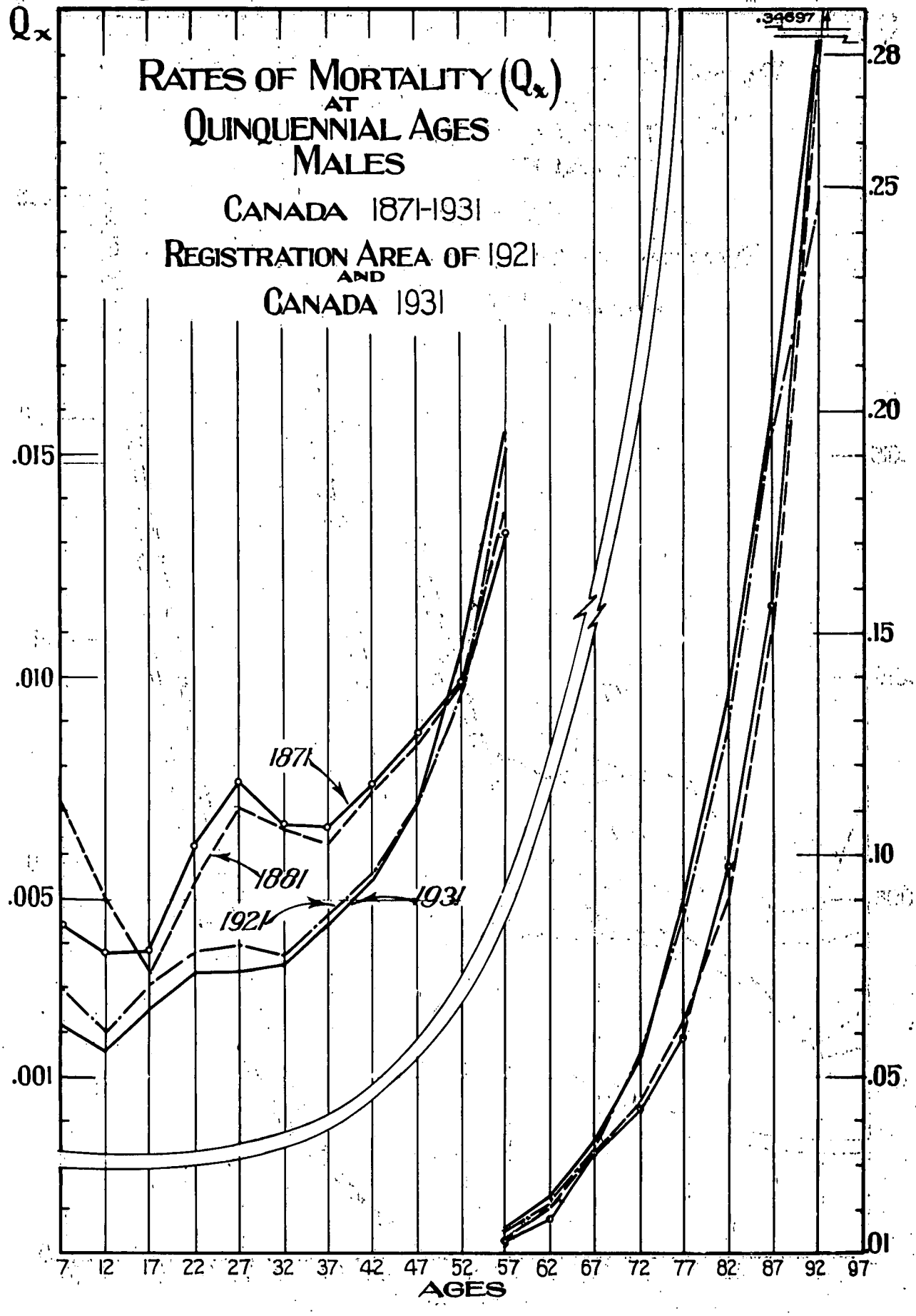
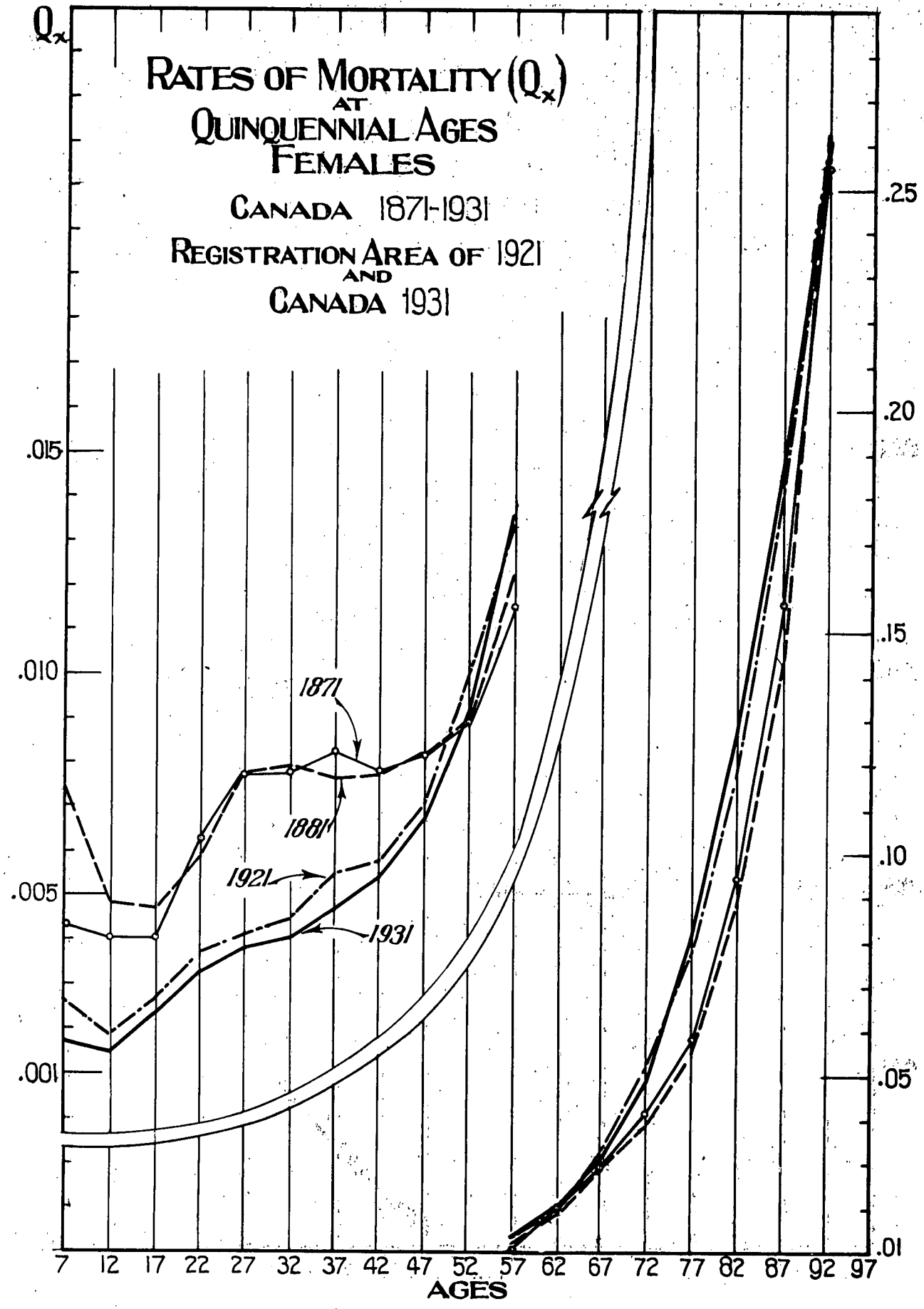

Qx
RATES OF MORTALITY (Qx)
AT
QUINQUENNIAL AGES
MALES
CANADA 1871-1931
REGISTRATION AREA OF 1921
AND
CANADA 1931
.34697
.28
.25
.20
.15
.10
.05
.01
.015
.010
.005
.001
1871
1881
1921
1931
7 12 17 22 27 32 37 42 47 52 57 62 67 72 77 82 87 92 97
AGES

CHART II


Q_x
RATES OF MORTALITY (Q_x)
AT
QUINQUENNIAL AGES
FEMALES
CANADA 1871-1931
REGISTRATION AREA OF 1921
AND
CANADA 1931
.015
.010
.005
.001
.25
.20
.15
.10
.05
.01
1871
1881
1921
1931
7 12 17 22 27 32 37 42 47 52 57 62 67 72 77 82 87 92 97
AGES

and 18.0 p.c. took place in 1871 and 1881, respectively. Of the 1,092 deaths in 1871 786 or 72 p.c. would have to be distributed among the ages 70-84. Of the 1,268 deaths in 1881, 1,034 or 82 p.c. would have to be distributed among the same ages. In other words, between ages 70 and 84 there would be an understatement of deaths of about 36.5 p.c. in the census of 1871, and an understatement of 25.8 p.c. in 1881 which is very improbable.

It has already been pointed out that an examination was made of the deaths between ages 61-81 and 81-101 in the census subdistricts of 1871 and 1881. The deaths estimated were used in the calculation of the life tables. The 1,092 deaths required in 1871 and the 1,268 in 1881 to bring ages 50-87 up to the expectation of 1921 would have to be in addition to the estimated deaths and an examination of the districts showed no evidence of their omission.

Male deaths of 1871 and 1881 (actual) and deaths among 1871 and 1881 male population if 1921 rates prevailed from age 55 to 100 and over, by age groups.

Age Group	Deaths of 1871	Deaths among 1871 Pop. If 1921 rates prevailed	Increase	P.C. Under-Statement	Deaths of 1881	Deaths among 1881 Pop. If 1921 rates prevailed	Increase	P.C. Under-Statement
55-59	598	682	84		749	825	76	
60-64	676	805	129		1,032	1,080	48	
65-69	937	940	3		1,143	1,158	15	
70-74	836	1,090	254)		1,123	1,416	293)	
75-79	724	1,061	337)	36.5	1,007	1,396	389)	25.8
80-84	(1)588	783	195)		(1)832	1,184	352)	
85-89	(1)324	411	87		(1)501	668	167	
90-94	203	206	3		362	290	-72	
95-99	130	130	-		237	237	-	
100 +	20	20	-		63	63	-	
Total	5,036	6,128	1,092	21.6	7,049	8,317	1,268	18.0

(1) Adjusted deaths.

There is, of course, always the possibility of an overstatement of the ages of the population and an understatement of the ages at death. Although it has been observed that these overstatements occur at the older ages, it is obvious that if such overstatement occurred it would be shown in the distribution

of the q_x's by compensatory peaks and depressions, e.g., the rates, at, say, 50-60 would be lower than normal while those for 60-70 would compensate. There is no evidence of this being the case.

It would seem then that the differences in the life tables between 1871, 1881 and 1921 are more or less real. If so, is there any reason why the q_x's at 50-87 should be lower in the earlier years? (The differences in the lower ages are easily explained.) To answer this let us remember that the population of Canada at ages 50-87 in 1871 and 1881 was largely composed of pioneers. Evidence is given in 1931 life tables and elsewhere that the pioneer population--a moving population--is really a selection, and if this is granted there is no difficulty in believing that its life expectation was higher.

There would be a further selection caused by the fact that the q_x's were so much higher at the earlier ages. They were not dying at 50-87 because the most vulnerable of them died before 50. In the 60 years intervening till 1931 the expectations up to 50 were raised very considerably, meaning that the persons over 50 in 1931 contained a considerable element who formerly were dying off below the age of 50. It is obvious that if the expectation of life is raised after a lapse of time, it is not raised indefinitely. Those who formerly would have died at 40 probably died 10 years later.

Sex Comparison - The comparison between sexes in 1871 and 1881 is of great interest. Its consistency with the findings of 1921 and 1931 carries conviction as to completeness of data and accuracy of statement of ages in the early years. There are sufficient points of difference as well as of resemblance to strengthen this conviction. As one would expect, the female line in the early adult ages crosses and recrosses the male line somewhat earlier in 1871 and 1881, and the differences between the two sexes where the female line is above that of the male are somewhat more drastic in these years. (See Chart 3).

No doubt the causes of the female excess, viz., childbirth, tuberculosis, etc., were more pronounced in their effects in those earlier years.

Comparison with English Life Tables - The comparisons up to this point have shown quite conclusively the reliability of the data and the influence selection has had on the death rates of the Canadian people in the early years. Let us now compare the 1881 life table of Canada with the English tables based on the mortality of 1881-90. Two tables are given for this period, one for England and Wales in general, the other for Three Selected Healthy Districts.[x] The male mortality rates for England and Wales in general, low as they are at the young ages, rise over and above the rates of Canada at age 27 and continue to increase until age 92. At age 37 the rates are nearly twice that of Canada and remain high through the middle ages. A similar trend is seen between the female mortality rates, the only difference being that the crossing occurs a quinquennium later and the increase is less drastic.

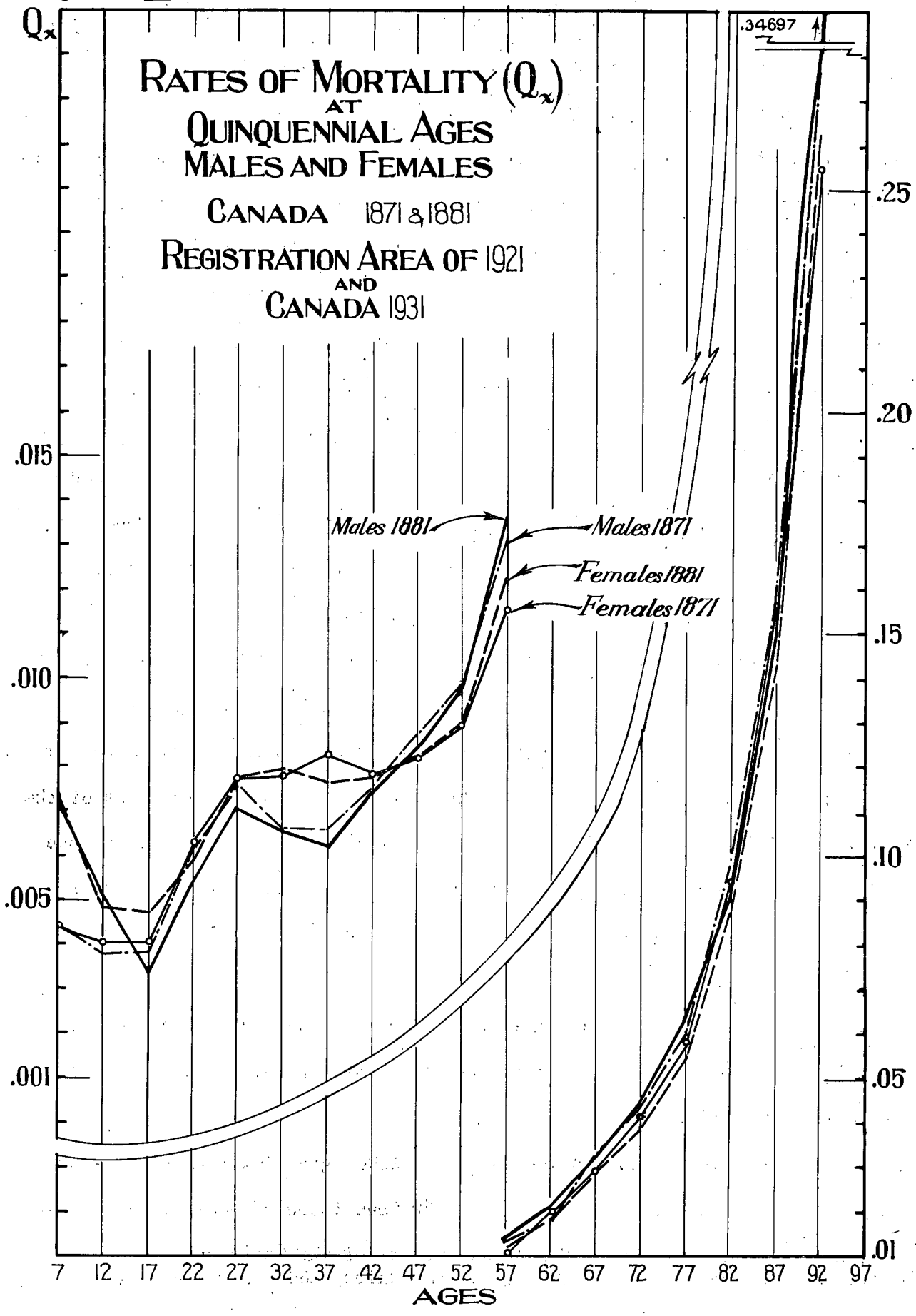
The male mortality rates of the Three Selected Healthy Districts of England do not exceed those of Canada until age 32 and the increase is not so pronounced until age 52 when the rates are considerably higher (.00982 for Canada, .01478 for the Three Selected Healthy Districts). The female rates of the Healthy Districts rise above Canada's at age 42, approximately the end of the child-bearing period. This apparently proves that the risks of maternity in Canada in the pioneer age were greater, where indeed often medical assistance was not available.

All these facts are suggestive of the influence of selection, corroborating with the statement made earlier that the most vulnerable died before 50, leaving the fittest at ages 50-87.

The tables of Massachusetts, U.S., 1890, give lower rates at ages 7-12 but considerably higher rates from 17-92 than those of Canada, 1881. Ex-

[x]See Supplement to the Sixty-Fifth Annual Report of the Registrar General of Births, Deaths, and Marriages in England and Wales, 1891-1900, Part I.

CHART III


Q_x
RATES OF MORTALITY (Q_x)
AT
QUINQUENNIAL AGES
MALES AND FEMALES
CANADA 1871 & 1881
REGISTRATION AREA OF 1921
AND
CANADA 1931
.34697
.015
.010
.005
.001
.25
.20
.15
.10
.05
.01
Males 1881
Males 1871
Females 1881
Females 1871
7 12 17 22 27 32 37 42 47 52 57 62 67 72 77 82 87 92 97
AGES

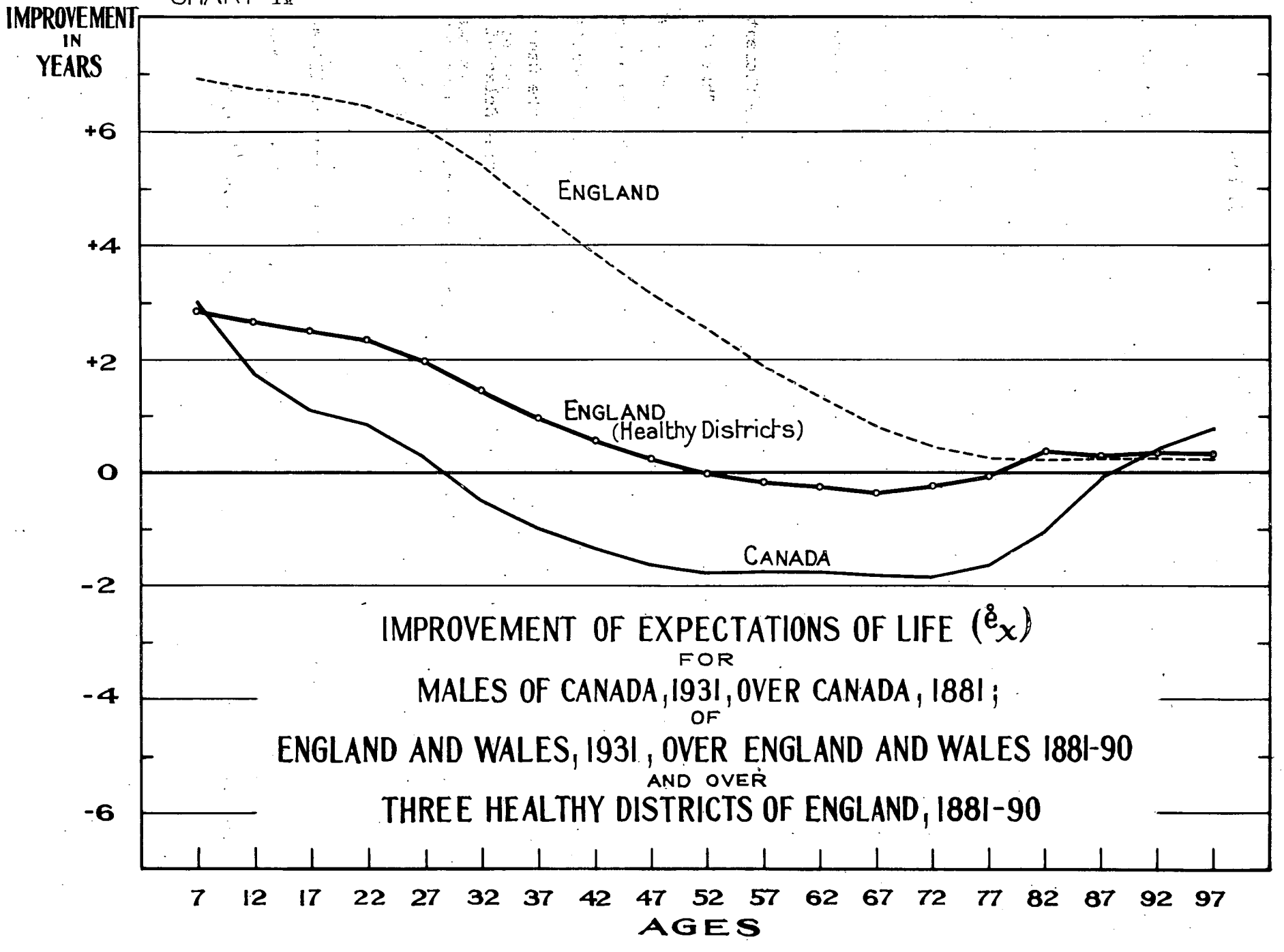
cept for the slightly higher rates from age 7 to 32, the Massachusetts mortality was comparatively close to the general English rates.

Correlation - The improvement in expectation of life for males from 1881-1931 was measured for Canada, England and Wales and the Three Selected Healthy Districts of England. The improvement in expectation of the latter two were correlated with improvement for Canada. The coefficient of correlation, r, in the first case was .77 and the regression equation (where Y represents the improvement of England and Wales) was $Y = 1.42X + 3.68$. Although a correlation of .77 seems high, yet when the differences were charted it was doubtful whether it indicates anything more than a rough common trend as shown by the s-shaped curve of England and Wales and the u-shaped curve of Canada.

In the case of the Three Selected Healthy Districts the coefficient of correlation was .92 and the regression equation $Y_1 = .71X + 1.14$. This high correlation was reflected in the charting of the improvement. A u-shaped curve, almost identical with that of Canada, resulted and a definite relationship was established. These healthy districts were really composed of a healthy people--a select class. On this reasoning we must conclude, therefore, that the Canadian people were a selection, even healthier than those of the Three Selected Healthy Districts of England. This seems reasonable when we consider what has already been said regarding the Canadian population as a pioneer and moving people.

Even more convincing than the coefficients of correlation, as illustrating the points just observed, is the accompanying chart. (Chart 4). The resemblance between Canada and the Healthy Districts is unmistakeable.

CHART IV



IMPROVEMENT OF EXPECTATIONS OF LIFE ($\mathring{e}_x$)
FOR
MALES OF CANADA, 1931, OVER CANADA, 1881;
OF
ENGLAND AND WALES, 1931, OVER ENGLAND AND WALES 1881-90
AND OVER
THREE HEALTHY DISTRICTS OF ENGLAND, 1881-90

Expectations of life ($\mathring{e}_x$) of Canada, 1881, England and Wales and Three Selected Healthy Districts of England, 1881-1890, showing improvement between 1881 and 1931, differences being data for correlations.

Age x	$\mathring{e}_x$ Canada 1881 (1)	$\mathring{e}_x$ Canada 1931 (2)	X Col.2-Col.1 (3)	$\mathring{e}_x$ England & Wales 1881-90 (4)	$\mathring{e}_x$ Three Selected Healthy Dists. 1881-90 (5)	$\mathring{e}_x$ England & Wales 1931 (6)	Y Col.6-Col. (7)	Y_1 Col.6-Col.5 (8)
7	57.60	60.57	2.97	51.50	55.61	58.47	6.97	2.86
12	54.42	56.14	1.72	47.18	51.28	53.95	6.77	2.67
17	50.54	51.64	1.10	42.74	46.90	49.40	6.66	2.50
22	46.52	47.36	0.84	38.66	42.78	45.10	6.44	2.32
27	42.90	43.14	0.24	34.75	38.83	40.82	6.07	1.99
32	39.33	38.84	-0.49	31.06	34.99	36.47	5.41	1.48
37	35.52	34.54	-0.98	27.50	31.18	32.15	4.65	0.97
42	31.64	30.31	-1.33	24.06	27.42	27.95	3.89	0.53
47	27.81	26.15	-1.66	20.75	23.71	23.92	3.17	0.21
52	23.96	22.17	-1.79	17.57	20.10	20.09	2.52	-0.01
57	20.19	18.43	-1.76	14.57	16.63	16.47	1.90	-0.16
62	16.68	14.90	-1.78	11.81	13.40	13.13	1.32	-0.27
67	13.61	11.76	-1.85	9.36	10.47	10.17	0.81	-0.37
72	10.88	9.01	-1.87	7.23	7.90	7.68	0.45	-0.22
77	8.37	6.74	-1.63	5.43	5.76	5.69	0.26	-0.07
82	6.04	4.97	-1.07	3.99	4.09	4.20	0.21	0.35
87	3.72	3.63	-0.09	2.89	2.86	3.12	0.23	0.26
92	2.20	2.57	0.37	2.08	2.00	2.35	0.27	0.35
97	0.94	1.69	0.75	1.51	1.42	1.76	0.25	0.34

Method of Graduation and Formulae Used - It was felt that an abridged life table for 1871 and 1881 would fulfill all the purpose to which a complete life table could be applied. The method followed was that of Mr. George King.[x]

Pivotal values were found for each age group at age 12, 17, etc., for population and deaths by the formula

$$u_{12} = .216w_{10} - .008(w_5 + w_{15})$$

$$u_{17} = .216w_{15} - .008(w_{10} + w_{20}) \text{ etc.,}$$

where u_x is the number between age x and x+1 and w_x the number between x and x+5. The unsymmetrical third degree formula

$$u_7 = .192w_5 + .016w_{10} - .008w_{15}$$

gave the value for age 7. The pivotal value for the deaths was divided by the

[x] See Supplement to the Seventy-Fifth Annual Report of the Registrar General of Births, Deaths and Marriages in England and Wales, 1914, Part I, pp 26-30.

corresponding value of the number living, giving us m_x (the central rate of mortality). From this the rates q_x were calculated, using the formula

$$q_x = \frac{2m_x}{2 + m_x} \quad ;$$

p_x, the probability of living a year is q_x subtracted from unity. Taking first, second and third differences of log p_x and employing formula (6) given at the end of the Introduction, we have the values of log ${}_5p_x$ (the logarithm of the probability of living five years) from age 12 to 92. Formula (7) was employed to give the value of log ${}_5p_x$ for age 7, the youngest age of the table.

Termination of Tables - The life tables do not end at age 92, but in the case of the males they must be continued to age 102 for 1871, 1881, 1931 and to age 107 for 1921 to bring them to a satisfactory conclusion. The third difference of log p_x for age 82 in 1871 (the last age for which it is obtainable) was 2415. Being negative this figure was carried through as a constant, enabling us to find log ${}_5p_x$ for age 87, 92, 97 and also log p_x for age 102. However, in 1881 the third difference for 82 was positive and as a result could not be used as a constant. It was necessary to use age 77, the third difference for which was 7084 and negative. This then is our constant to the end of the table. Now in the case of 1921 the third differences for ages 77 and 82 were positive. The fourth difference (1356) for age 77 would then be negative. This difference was taken as the constant carried through to terminate the table at age 112.

The female tables are concluded in a similar manner, the last survivors reaching age 102 in 1871 and 1881 and age 107 in 1921 and 1931.

Radix - The column, l_x, or the number living, begins with 100,000 at age 7. Its logarithm is 5.00000. To this is added the corresponding log ${}_5p_x$ at each age successively, giving us the values of log l_x, and hence l_x. For 1921 and 1931, however, the l_x at age 7 as published in the Canadian Life Tables, 1931, was taken as the radix.

Expectation of life - Taking first, second and third differences of l_x at each quinquennial age and applying formula (8), given at the end of the Introduction, we arrive at $N'_{x:\overline{5}|}$, the sum of a quinquennial section of the sum of the column l_x from age x+1 to the oldest age in the table, which sum is denoted by the symbol N'_x. To find the value of $N'_{x:\overline{5}|}$ for age 7 formula (9) was used. To find $N'_{x:\overline{5}|}$ for age 97 the previous formula could not be applied; it was necessary to use another method. The l_x for age 97 is multiplied by the p_x of the same age. The result is the l_x for age 98. Having the l_x for age 102, by interpolation we arrive at l_{99}, l_{100}, l_{101}, which gives us $N'_{97:\overline{5}|}$. By adding successive values upwards we have the N'_x at each quinquennial age of the table. The complete expectation of life is then found by dividing N'_x at each age by the corresponding l_x and by adding .5 to the result.

The method just described to find $N'_{x:\overline{5}|}$ for an age where the formula cannot be used, instead of applying to age 97, may apply to a quinquennium later, depending on the age of the last survivors, as is the case in the table for males of 1921 and females of 1921 and 1931.

Notation -

l_x = the number living according to the life table at the beginning of the year of age x.

d_x = the number dying during the year of age x.

q_x = the probability of dying during the following year for a person of age x.

p_x = the probability of living to the end of the year of age for a person alive at age x.

$\mathring{e}_x$ = the complete expectation of life of a person alive at age x.

Practical Applications of the Tables - The need of life tables for 1871 and 1881 can best be illustrated by a table taken from the Population Monograph in which the object was to find the probable number of persons who em-

igrated from the province of Nova Scotia between the period 1881-91. It is seen that in 1881 the number aged 5-9 is 56,380; in 1891 this group had reached the ages 15-19, numbering 49,955 persons. There was a decrease of 6,425 due to two factors, death and emigration.

How many should be attributed to death and how many to emigration? By finding the chances of a person aged 7 (the mid-point of the group) living ten years we can easily find the chances of a person dying in ten years. Multiplying the population in age group 5-9 by the probable death rate the result is the number who probably died. Subtracting this from the total decrease we have the number who probably emigrated. To the figures in the table were applied the probable death rates of 1931 and 1881.

Because of the great improvement in mortality over the fifty-year period the results obtained from the 1931 rates do not present a true picture of the actual situation. Hence the importance of the life tables of 1871 and 1881 when treating statistics of the same years. This is only one case of many to which these life tables can be applied.

Population 5-44, by age groups, and same population 10 years later, Nova Scotia, 1881, showing decrease due to death and emigration using Life Tables of 1881 and 1931.

Age in 1881	Population in 1881	Population in 1891	Age in 1891	Decrease	Decrease Probably Due to Death		Decrease Probably Due to Emigration	
					By 1881 Life Table	By 1931 Life Table	By 1881 Life Table	By 1931 Life Table
5-9	56,380	49,955	15-19	6,425	2,948	1,070	3,477	5,355
10-14	52,879	43,223	20-24	9,656	2,140	1,244	7,516	8,412
15-19	48,180	33,029	25-29	15,151	2,402	1,505	12,749	13,646
20-24	41,574	26,329	30-34	15,245	2,651	1,401	12,594	13,844
25-29	32,382	23,383	35-39	8,999	2,088	1,151	6,911	7,848
30-34	26,432	21,901	40-44	4,531	1,667	1,111	2,864	3,420
35-39	24,618	20,180	45-49	4,438	1,729	1,293	2,709	3,145
40-44	20,997	18,005	50-54	2,992	1,693	1,465	1,299	1,527

Formulae -

(1) $u_{x+10} = .5w_{x+10} - .0625\,(w_{x+20} - w_x)$

(2) $u_x = \dfrac{3w_{x-1} + 24w_x - 2w_{x+1}}{25}$

(3) $u_{12} = .216w_{10} - .008(w_5 + w_{15})$

$u_{17} = .216w_{15} - .008(w_{10} + w_{20})$

(4) $u_7 = .192w_5 + .016w_{10} - .008w_{15}$

(5) $q_x = \dfrac{2m_x}{2+m_x}$

(6) $w_5 = 5u_o + 7\Delta u_o + 1.6\Delta^2 u_o - .2\Delta^3 u_o$

(7) $w_o = 5u_o + 2\Delta u_o - .4\Delta^2 u_o + .2\Delta^3 u_o$

(8) $w_6 = 5u_o + 8\Delta u_o + 2.6\Delta^2 u_o - .2\Delta^3 u_o$

(9) $w_1 = 5u_o + 3\Delta u_o - .4\Delta^2 u_o + .2\Delta^3 u_o$

Tables

TABLE 1 - Abridged Life Table of four provinces[1] of Canada, males and females, based on the population and deaths of 1871

Age x	l_x	d_x	q_x	p_x	$\mathring{e}_x$
			MALES		
7	100,000	442	.00442	.99558	58.10
12	97,927	371	.00379	.99621	54.28
17	96,137	366	.00381	.99619	50.25
22	93,899	580	.00618	.99382	46.38
27	90,711	690	.00761	.99239	42.92
32	87,452	582	.00666	.99334	39.43
37	84,620	558	.00660	.99340	35.66
42	81,726	616	.00754	.99246	31.84
47	78,518	685	.00872	.99128	28.03
52	75,010	742	.00989	.99011	24.23
57	70,945	937	.01321	.98679	20.47
62	65,890	1,188	.01803	.98197	16.84
67	58,410	1,925	.03295	.96705	13.65
72	48,408	2,079	.04294	.95706	10.95
77	37,764	2,250	.05957	.94043	8.32
82	25,835	2,520	.09755	.90245	5.99
87	13,831	2,159	.15608	.84392	4.06
92	4,555	1,260	.27653	.72347	2.59
97	534	247	.46219	.53781	1.53
102	10	10			
			FEMALES		
7	100,000	434	.00434	.99566	57.67
12	97,879	396	.00405	.99595	53.87
17	95,964	389	.00405	.99595	49.89
22	93,758	591	.00630	.99370	46.01
27	90,546	699	.00772	.99228	42.55
32	87,054	688	.00790	.99210	39.15
37	83,595	694	.00830	.99170	35.67
42	80,247	633	.00789	.99211	32.05
47	77,099	633	.00821	.99179	28.26
52	73,911	661	.00894	.99106	24.37
57	70,414	813	.01154	.98846	20.45
62	65,340	1,337	.02046	.97954	16.83
67	57,844	1,723	.02979	.97021	13.68
72	48,598	2,023	.04162	.95838	10.79
77	38,160	2,217	.05811	.94189	8.05
82	26,417	2,500	.09463	.90537	5.50
87	14,195	2,218	.15624	.84376	3.03
92	4,964	1,263	.25441	.74559	2.72
97	689	309	.44825	.55175	1.55
102	12	8	.69800	.30200	-

[1] Ontario, Quebec, Nova Scotia, New Brunswick.

TABLE 2 - Abridged Life Table of four provinces[1] of Canada, males and females, based on the population and deaths of 1881

Age_x	l_x	d_x	q_x	p_x	$\mathring{e}_x$
			MALES		
7	100,000	722	.00722	.99278	57.60
12	96,799	493	.00509	.99491	54.42
17	94,772	317	.00334	.99666	50.54
22	92,882	501	.00539	.99461	46.52
27	90,047	638	.00708	.99292	42.90
32	86,960	569	.00654	.99346	39.33
37	84,242	522	.00620	.99380	35.52
42	81,476	609	.00748	.99252	31.64
47	78,325	661	.00844	.99156	27.81
52	74,908	736	.00982	.99018	23.96
57	70,830	968	.01366	.98634	20.19
62	65,290	1,352	.02071	.97929	16.68
67	57,449	1,867	.03249	.96751	13.61
72	47,630	2,093	.04394	.95606	10.88
77	36,709	2,300	.06266	.93734	8.37
82	25,221	2,292	.09086	.90914	6.04
87	14,382	2,143	.14901	.85099	3.72
92	4,044	1,403	.34697	.65303	2.20
97	234	132	.56423	.43577	0.94
102	1	1			
			FEMALES		
7	100,000	743	.00743	.99257	56.25
12	97,429	473	.00485	.99515	52.66
17	94,178	445	.00472	.99528	49.39
22	90,380	536	.00593	.99407	46.36
27	87,466	683	.00781	.99219	42.82
32	84,033	671	.00798	.99202	39.47
37	80,790	617	.00764	.99236	35.95
42	77,727	612	.00787	.99213	32.27
47	74,705	616	.00824	.99176	28.48
52	71,251	641	.00899	.99101	24.73
57	67,250	823	.01224	.98776	21.05
62	62,455	1,205	.01930	.98070	17.47
67	55,507	1,653	.02978	.97022	14.32
72	46,669	1,818	.03896	.96104	11.55
77	37,166	2,050	.05515	.94485	8.86
82	26,367	2,299	.08721	.91279	6.47
87	15,044	2,162	.14374	.85626	4.27
92	5,392	1,416	.26261	.73739	2.68
97	689	315	.45791	.54209	1.54
102	12				

[1] Ontario, Quebec, New Brunswick and Nova Scotia.

TABLE 3 - Abridged Life Table of Registration Area of 1921(1), Canada, males and females, based on the population and deaths of 1921.

Age_x	l_x	d_x	q_x	p_x	$\mathring{e}_x$
			MALES		
7	99,298	301	.00303	.99696	60.23
12	98,136	196	.00200	.99800	55.92
17	96,981	299	.00308	.99692	51.55
22	95,229	358	.00376	.99624	47.45
27	93,391	372	.00398	.99602	43.34
32	91,613	340	.00371	.99629	39.13
37	89,782	416	.00463	.99537	34.88
42	87,574	485	.00554	.99446	30.69
47	84,911	616	.00726	.99274	26.57
52	81,532	792	.00972	.99028	22.57
57	76,872	1,160	.01509	.98491	18.78
62	70,392	1,523	.02163	.97837	15.26
67	61,879	2,033	.03286	.96714	12.00
72	50,119	2,798	.05582	.94418	9.21
77	35,335	3,066	.08677	.91323	6.99
82	20,665	2,640	.12773	.87227	5.21
87	8,948	1,737	.19408	.80592	3.96
92	2,634	652	.24740	.75260	3.18
97	578	162	.28062	.71938	2.63
102	104	32	.30908	.69092	1.99
107	14	5	.36562	.63438	1.79
112	1	1			
			FEMALES		
7	99,384	260	.00262	.99738	60.64
12	98,319	185	.00188	.99812	56.26
17	97,273	261	.00268	.99732	51.84
22	95,765	356	.00372	.99628	47.62
27	93,905	389	.00414	.99586	43.51
32	91,923	414	.00450	.99550	39.39
37	89,685	497	.00554	.99446	35.31
42	87,182	508	.00583	.99417	31.25
47	84,504	598	.00708	.99292	27.16
52	81,076	825	.01017	.98983	23.20
57	76,581	1,027	.01341	.98659	19.41
62	70,854	1,380	.01947	.98053	15.77
67	62,660	2,054	.03278	.96722	12.48
72	51,132	2,647	.05177	.94823	9.71
77	37,198	2,916	.07838	.92162	7.40
82	22,923	2,683	.11705	.88295	5.46
87	10,724	1,957	.18252	.81748	3.96
92	3,269	840	.25697	.74303	2.87
97	581	172	.29569	.70431	1.95
102	49	20	.41150	.58850	1.74
107	1				

(1) Canada exclusive of Quebec, Yukon and Northwest Territories.

TABLE 4 - Abridged Life Table of Canada(1), 1931, males and females, based on population of 1931 and deaths of 1930-32.

Age_x	l_x	d_x	q_x	p_x	$\mathring{e}_x$
			MALES		
7	99,500	215	.00216	.99784	60.57
12	98,527	150	.00152	.99848	56.14
17	97,612	248	.00254	.99746	51.64
22	96,210	321	.00334	.99666	47.36
27	94,563	321	.00339	.99661	43.14
32	92,966	327	.00352	.99648	38.84
37	91,204	399	.00437	.99563	34.54
42	89,057	483	.00542	.99458	30.31
47	86,413	617	.00714	.99286	26.15
52	82,846	878	.01060	.98940	22.17
57	77,834	1,206	.01549	.98451	18.43
62	71,201	1,625	.02282	.97718	14.90
67	61,805	2,205	.03567	.96433	11.76
72	49,656	2,762	.05563	.94437	9.01
77	34,930	3,109	.08900	.91100	6.74
82	19,880	2,701	.13586	.86414	4.97
87	8,320	1,658	.19933	.80067	3.63
92	2,231	632	.28331	.71669	2.57
97	314	123	.39022	.60978	1.69
102	17	17			
			FEMALES		
7	99,571	170	.00171	.99829	61.44
12	98,828	147	.00149	.99851	56.88
17	97,947	230	.00235	.99765	52.37
22	96,611	319	.00330	.99670	48.06
27	94,903	365	.00385	.99615	43.88
32	93,045	381	.00409	.99591	39.70
37	91,040	434	.00477	.99523	35.52
42	88,778	483	.00544	.99456	31.36
47	86,185	586	.00680	.99320	27.23
52	82,947	763	.00920	.99080	23.19
57	78,564	1,072	.01364	.98636	19.34
62	72,482	1,462	.02017	.97983	15.74
67	64,159	1,998	.03114	.96886	12.44
72	53,003	2,608	.04920	.95080	9.51
77	38,628	3,172	.08211	.91789	7.10
82	22,906	2,917	.12736	.87264	5.26
87	10,174	1,893	.18610	.81390	3.89
92	3,040	791	.26010	.73990	2.83
97	528	185	.35045	.64955	1.92
102	44	20	.45595	.54405	1.73
107	1				

(1) Exclusive of Yukon and Northwest Territories.

TABLE 5 - Comparison of number of survivors, male and female, out of 100,000 alive at age 7 ($_7l_x$), Canada[1], 1871 and 1881, Registration Area of 1921[2] and Canada[3], 1931.

Age$_x$	Canada			
	1871[1]	1881[1]	1921[2]	1931[3]
	MALES			
7	100,000	100,000	100,000	100,000
12	97,927	96,799	98,830	99,022
17	96,137	94,772	97,667	98,103
22	93,899	92,882	95,902	96,693
27	90,711	90,047	94,051	95,038
32	87,452	86,960	92,261	93,433
37	84,620	84,242	90,417	91,662
42	81,726	81,476	88,193	89,505
47	78,518	78,325	85,511	86,847
52	75,010	74,908	82,108	83,262
57	70,945	70,830	77,415	78,225
62	65,890	65,290	70,890	71,559
67	58,410	57,449	62,316	62,116
72	48,408	47,630	50,473	49,906
77	37,764	36,709	35,585	35,106
82	25,835	25,221	20,811	19,980
87	13,831	14,382	9,011	8,362
92	4,555	4,044	2,653	2,242
97	534	234	582	316
102	10	1	105	17
107			14	
	FEMALES			
7	100,000	100,000	100,000	100,000
12	97,879	97,429	98,928	99,254
17	95,964	94,178	97,876	98,369
22	93,758	90,380	96,359	97,027
27	90,546	87,466	94,487	95,312
32	87,054	84,033	92,498	93,446
37	83,595	80,790	90,241	91,432
42	80,247	77,727	87,722	89,160
47	77,099	74,705	85,028	86,556
52	73,911	71,251	81,579	83,304
57	70,414	67,250	77,056	78,902
62	65,340	62,455	71,293	72,794
67	57,844	55,507	63,048	64,435
72	48,598	46,669	51,449	53,231
77	38,160	37,166	37,429	38,794
82	26,417	26,367	23,065	23,005
87	14,195	15,044	10,790	10,218
92	4,964	5,392	3,289	3,053
97	689	689	585	530
102	12	12	49	44
107			1	1

(1) Ontario, Quebec, New Brunswick and Nova Scotia.

(2) Canada exclusive of Quebec, Yukon and Northwest Territories.

(3) Exclusive of Yukon and Northwest Territories.

TABLE 6 - Probability of Living 10 Years.

$(10p_x)$

	Canada, Males				Canada, Females			
Age_x	1871	1881	1921	1931	1871	1881	1921	1931
7	.96137	.94772	.97667	.98103	.95964	.94178	.97876	.98369
12	.95887	.95953	.97037	.97648	.95790	.92765	.97403	.97756
17	.94356	.95014	.96298	.96876	.94354	.92873	.96537	.96892
22	.93134	.93624	.96203	.96629	.92850	.92977	.95988	.96309
27	.93285	.93553	.96136	.96448	.92323	.92367	.95506	.95929
32	.93452	.93694	.95591	.95796	.92181	.92496	.94842	.95413
37	.92789	.92976	.94574	.94747	.92229	.92468	.94223	.94667
42	.91782	.91939	.93100	.93025	.92104	.91668	.92997	.93432
47	.90355	.90431	.90532	.90072	.91329	.90021	.90624	.91157
52	.87842	.87160	.86338	.85944	.88404	.87655	.87391	.87384
57	.82331	.81108	.80496	.79407	.82148	.82538	.81821	.81665
62	.73468	.72951	.71199	.69741	.74377	.74724	.72166	.73126
67	.64653	.63898	.57104	.56517	.65971	.66957	.59366	.60206
72	.53369	.52952	.41232	.40035	.54358	.56498	.44831	.43217
77	.36625	.39178	.25322	.23819	.37199	.40478	.28828	.26339
82	.17631	.16034	.12748	.11221	.18791	.20450	.14260	.13271
87	.03861	.01627	.06459	.03779	.04854	.04580	.05422	.05187
92	.00220	.00025	.03958	.00758	.00242	.00223	.01490	.01441
97	-	-	.02405	-	-	-	-	.00189

TABLE 7 - Comparison of Expectations of Life Derived by the Abridged Method and by the Extended Method for Canada, 1921 and 1931, males and females.

Age x	$\mathring{e}_x$ 1921 Calculated by		$\mathring{e}_x$ 1931 Calculated by	
	Abridged Method	Extended Method	Abridged Method	Extended Method
	MALES			
7	60.23	60.25	60.57	60.61
12	55.92	55.97	56.14	56.14
17	51.55	51.61	51.64	51.64
22	47.45	47.45	47.36	47.36
27	43.34	43.33	43.14	43.12
32	39.13	39.12	38.84	38.82
37	34.88	34.87	34.54	34.52
42	30.69	30.68	30.31	30.29
47	26.57	26.56	26.15	26.14
52	22.57	22.56	22.17	22.15
57	18.78	18.77	18.43	18.41
62	15.26	15.26	14.90	14.92
67	12.00	12.00	11.76	11.76
72	9.21	9.19	9.01	9.00
77	6.99	6.97	6.74	6.72
82	5.21	5.19	4.97	4.95
87	3.96	3.90	3.63	3.61
92	3.18	3.11	2.57	2.61
97	2.63	2.44	1.69	1.87
102	1.99	1.80	-	1.33
	FEMALES			
7	60.64	60.61	61.44	61.44
12	56.26	56.26	56.88	56.89
17	51.84	51.84	52.37	52.37
22	47.62	47.61	48.06	48.06
27	43.51	43.50	43.88	43.88
32	39.39	39.39	39.70	39.70
37	35.31	35.30	35.52	35.52
42	31.25	31.25	31.36	31.36
47	27.16	27.15	27.23	27.22
52	23.20	23.19	23.19	23.19
57	19.41	19.40	19.34	19.33
62	15.77	15.76	15.74	15.74
67	12.48	12.47	12.44	12.44
72	9.71	9.69	9.51	9.51
77	7.40	7.37	7.10	7.08
82	5.46	5.43	5.26	5.25
87	3.96	3.92	3.89	3.88
92	2.87	2.89	2.83	2.87
97	1.95	2.12	1.92	2.12
102	1.74	1.51	1.73	1.57

TABLE 8 - Comparison of number of survivors (l_x), male and female, of Canadian Life Tables, 1871 and 1881, with (1) those of England and Wales based on mortality of 1871-1880 and 1881-1890, (2) Three Selected Healthy Districts of England based on mortality of 1881-1890 and (3) State of Massachusetts, 1890.

Age x	Canada, 1881	Massachusetts, 1890	England and Wales, 1881-1890	Three Selected Healthy Districts of England 1881-1890	England and Wales 1871-1880	Canada, 1871
			MALES			
7	100,000	100,000	100,000	100,000	100,000	100,000
12	96,799	97,551	98,647	98,757	97,573	97,927
17	94,772	95,379	97,420	97,518	95,791	96,137
22	92,882	91,984	95,250	95,620	93,099	93,899
27	90,047	87,874	92,432	93,187	89,691	90,711
32	86,960	83,633	88,825	90,294	85,711	87,452
37	84,242	79,286	84,562	87,095	81,150	84,620
42	81,476	74,695	79,573	83,498	75,897	81,726
47	78,325	69,777	73,779	79,367	70,010	78,518
52	74,908	64,173	67,069	74,484	63,378	75,010
57	70,850	57,443	59,192	68,477	55,712	70,945
62	65,290	49,786	49,855	60,834	46,987	65,890
67	57,449	41,324	39,093	51,039	37,142	58,410
72	47,630	31,396	27,578	39,034	26,483	48,408
77	36,709	20,850	16,503	25,481	16,085	37,764
82	25,221	11,364	7,641	12,762	7,744	25,835
87	14,382	4,639	2,392	4,183	2,642	13,831
92	4,044	1,045	420	718	559	4,555
97	234	89	32	48	62	534
			FEMALES			
7	100,000	100,000	100,000	100,000	100,000	100,000
12	97,429	97,565	98,820	98,676	97,657	97,879
17	94,178	95,199	97,590	97,193	95,830	95,964
22	90,380	91,808	95,360	95,062	93,185	93,758
27	87,466	87,975	92,592	92,524	89,922	90,546
32	84,033	83,841	89,136	89,586	86,229	87,054
37	80,790	79,563	85,207	86,419	82,122	83,595
42	77,727	75,062	80,920	83,108	77,585	80,247
47	74,705	70,377	76,195	79,567	72,626	77,099
52	71,251	65,338	70,688	75,438	67,200	73,911
57	67,250	59,586	63,968	70,244	60,910	70,414
62	62,455	52,526	55,713	63,444	53,000	65,340
67	55,507	44,465	45,621	54,387	43,449	57,844
72	46,669	34,873	33,860	42,753	32,379	48,598
77	37,166	24,710	21,566	29,125	20,845	38,160
82	26,367	14,495	10,914	15,791	10,837	26,417
87	15,044	6,315	3,956	6,040	4,126	14,195
92	5,392	1,647	898	1,384	1,021	4,964
97	689	189	108	154	141	689

TABLE 9 - Comparison of probable death rates (q_x), for males and females, Canada, 1871 and 1881, with (1) those of England and Wales based on mortality of 1871-1880 and 1881-1890, (2) Three Selected Healthy Districts of England based on mortality of 1881-1890 and (3) State of Massachusetts, 1890.

Age x	Canada, 1881	Massachusetts, 1890	England and Wales, 1881-1890	Three Selected Healthy Districts of England 1881-1890	England and Wales, 1871-1880	Canada, 1871
			MALES			
7	.00722	.00690	.00432	.00340	.00665	.00442
12	.00509	.00373	.00181	.00207	.00340	.00379
17	.00334	.00614	.00586	.00340	.00469	.00381
22	.00539	.00869	.00526	.00463	.00684	.00618
27	.00708	.00962	.00719	.00590	.00836	.00761
32	.00654	.01017	.00900	.00680	.01008	.00666
37	.00620	.01139	.01108	.00784	.01222	.00660
42	.00748	.01267	.01373	.00934	.01485	.00754
47	.00844	.01503	.01710	.01139	.01798	.00872
52	.00982	.01927	.02197	.01478	.02300	.00989
57	.01366	.02676	.02940	.02006	.02965	.01321
62	.02071	.03036	.04121	.02929	.04003	.01803
67	.03249	.04677	.05809	.04364	.05625	.03295
72	.04394	.06549	.08344	.06750	.08128	.04294
77	.06266	.10015	.12179	.10671	.11749	.05957
82	.09086	.13785	.17782	.16726	.16749	.09755
87	.14901	.21310	.25516	.25353	.23502	.15608
92	.34697	.32974	.35464	.36562	.31702	.27653
97	.56423	.47900	.47280	.49616	.41150	.46219
			FEMALES			
7	.00743	.00679	.00385	.00329	.00619	.00434
12	.00485	.00393	.00164	.00249	.00351	.00405
17	.00472	.00670	.00401	.00397	.00469	.00405
22	.00593	.00792	.00524	.00497	.00661	.00630
27	.00781	.00937	.00694	.00607	.00784	.00772
32	.00798	.00987	.00845	.00692	.00914	.00790
37	.00764	.01129	.00975	.00754	.01062	.00830
42	.00787	.01204	.01114	.00821	.01234	.00789
47	.00824	.01412	.01343	.00958	.01440	.00821
52	.00899	.01589	.01752	.01247	.01694	.00894
57	.01224	.02284	.02369	.01720	.02388	.01154
62	.01930	.02800	.03351	.02545	.03351	.02046
67	.02978	.04172	.04906	.03898	.04852	.02979
72	.03896	.05654	.07306	.06110	.07178	.04162
77	.05515	.08527	.10856	.09594	.10528	.05811
82	.08721	.12808	.15837	.14763	.15176	.09463
87	.14374	.19695	.22449	.21937	.21384	.15624
92	.26261	.29884	.30726	.31198	.29107	.25441
97	.45791	.43287	.40466	.42275	.38221	.44825

Appendix

Population and deaths on which preceding tables are based.

A - Population of 1871 and deaths of 1871 and 1881, by sex, for four provinces(1) of Canada, by varying age groups.

Age Group	Population of 1871		Age Group	Deaths			
				1871		1881	
	Male	Female		Male	Female	Male	Female
Total	1,764,311	1,721,450		24,428	22,232	31,437	28,456
0-1	54,378	52,170	0-4	11,751	10,148	14,843	12,359
1-6	255,422	246,491	5-11	1,317	1,267	2,312	2,277
6-11	247,720	240,488	11-21	1,597	1,711	1,860	2,185
11-16	221,404	212,375	21-31	1,958	2,102	2,144	2,439
16-21	185,164	192,849	31-41	1,246	1,519	1,420	1,742
21-31	278,444	292,005	41-61	2,335	1,992	2,839	2,582
31-41	187,320	187,133	61-81	3,159	2,568	4,292	3,433
41-51	140,334	130,896	81-101	1,010	869	1,626	1,347
51-61	96,149	85,464	101 +	16	24	28	26
61-71	61,802	50,981	Not stated	39	32	73	66
71-81	28,101	23,321					
81-91	6,417	5,703					
91-100	701	688					
100 +	73	68					
Not stated	882	818					

(1)Ontario, Quebec, New Brunswick and Nova Scotia.

B - Male population and deaths of 1871 and 1881 for four provinces(1) of Canada, Registration Area of 1921(2), and Canada, 1931, by five-year age groups.

Age Group	Population				Deaths			
	1871	1881	1921	1931	1871	1881	1921	1931
Total	1,764,311	2,039,227	3,342,969	3,919,378	24,572	31,604	36,411	38,462
0-4	252,813	284,267	374,517	364,738	11,751	14,843	10,827	7,629
5-9	257,275	266,661	375,106	393,521	1,146	1,938	1,166	742
10-14	227,461	245,909	323,528	384,043	872	1,260	674	534
15-19	192,092	225,550	282,880	377,068	747	786	866	867
20-24	158,986	198,819	252,822	332,387	975	1,065	947	988
25-29	130,666	153,515	262,860	296,277	985	1,074	1,043	971
30-34	106,460	121,884	265,964	269,374	714	800	999	929
35-39	87,833	107,341	269,830	269,437	584	672	1,250	1,064
40-44	77,877	91,121	224,721	268,569	589	681	1,250	1,372
45-49	66,752	81,420	184,027	252,382	583	690	1,340	1,733
50-54	55,146	67,847	151,774	208,961	550	673	1,488	2,135
55-59	44,985	54,301	113,614	153,679	598	749	1,720	2,306
60-64	36,796	49,339	96,565	121,231	676	1,032	2,111	2,661
65-69	28,400	34,982	68,022	93,074	937	1,143	2,269	3,218
70-74	19,162	25,139	44,728	68,236	836	1,123	2,539	3,657
75-79	11,873	15,727	26,498	37,928	724	1,007	2,368	3,259
80-84	5,875	8,867	13,630	17,721	(3)588	(3)832	1,827	2,407
85-89	1,985	3,204	5,465	6,544	(3)324	(3)501	1,136	1,339
90-94	663	929	1,331	1,538	203	362	361	455
95-99	231	320	326	319	130	327	104	105
100 +	98	96	79	66	21	63	37	24
Not stated	882	1,989	4,682	2,285	39	73	89	67

(1) Ontario, Quebec, New Brunswick and Nova Scotia.

(2) Canada exclusive of Quebec, Yukon and Northwest Territories.

(3) Adjusted figures.

C - Female population and deaths of 1871 and 1881 for four provinces(1) of Canada, Registration Area of 1921(2), and Canada(3), by five-year age groups.

Age Group	Population				Deaths			
	1871	1881	1921	1931	1871	1881	1921	1931
All ages	1,721,450	2,004,833	3,072,170	3,569,200	22,378	28,668	31,311	31,568
0-4	243,586	275,179	365,321	355,097	10,148	12,359	8,303	5,942
5-9	249,718	259,732	365,797	383,680	1,090	1,958	979	497
10-14	217,311	235,823	314,166	372,795	885	1,168	611	489
15-19	197,849	228,251	275,215	361,437	816	1,089	741	677
20-24	165,800	207,507	255,413	310,618	1,037	1,234	946	894
25-29	137,942	157,471	249,555	262,595	1,059	1,219	1,034	851
30-34	108,695	122,985	231,673	244,273	861	981	1,049	870
35-39	86,849	107,663	220,812	244,089	720	827	1,220	1,085
40-44	74,222	90,856	182,440	224,014	589	717	1,072	989
45-49	61,528	78,444	149,075	200,451	507	649	1,065	1,238
50-54	49,890	65,539	126,329	168,413	450	595	1,287	1,414
55-59	39,605	50,592	98,637	125,814	465	626	1,336	1,617
60-64	30,999	43,287	83,578	103,556	635	841	1,651	2,033
65-69	23,108	30,788	59,519	83,076	694	920	1,972	2,417
70-74	15,797	22,524	41,348	62,845	667	891	2,181	2,968
75-79	9,875	14,136	26,395	36,216	587	796	2,132	2,986
80-84	5,040	7,926	14,654	18,696	(4)490	(4)710	1,796	2,348
85-89	1,853	3,026	6,197	7,989	(4)303	(4)454	1,208	1,477
90-94	662	1,049	1,825	2,222	186	303	516	570
95-99	216	361	438	516	117	202	148	168
100 +	87	102	74	75	40	56	35	29
Not stated	818	1,592	3,709	733	32	73	29	9

(1) Ontario, Quebec, New Brunswick and Nova Scotia.

(2) Canada exclusive of Quebec, Yukon and Northwest Territories.

(3) Exclusive of Yukon and Northwest Territories.

(4) Adjusted deaths.