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ONTARIO MORTALITY PATTERNS, 1861-1921

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Abstract – The lack of adequate data on fertility and mortality has long hampered the study of Canadian population growth during the period before the beginning of a national system of vital registration. Attempts to trace the growth of the Canadian population have usually involved assuming that Canadian mortality patterns followed a course similar to that in Britain or the United States. The purpose of this paper is to take a new look at mortality change in Ontario during the nineteenth century by using Canadian census data to construct estimates of expectation of life at birth in the period from 1861 to 1921. Relying on techniques developed for the study of Third World populations, we will construct life tables for the Ontario population for each decade from 1861-1921. In the final section of the paper, we will compare the course of change in mortality in Ontario with the pattern in Quebec as revealed in the recent work of Bourbeau and Légaré (1982).

Key Words – **mortality, life tables, historical demography, Ontario**

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Introduction

Charting the course of mortality decline is central to an understanding of the dynamics of Canadian population growth. A knowledge of the dimensions and causes of the historic decline in death rates must underlie attempts to unravel the mysteries surrounding the growth of Canada's population during the nineteenth century and the long-term decline in fertility which had its roots in this period and which has transformed the structure of the Canadian population in the century since. But beyond this, it is important to gain more knowledge about the role of mortality change in Canadian social and economic development. The study of mortality can provide an opening to a broader investigation of the nature of social and economic change.

To those familiar with the study of the Canadian population in the late nineteenth and early twentieth centuries, the lack of knowledge about mortality is both well known and understandable. The dearth of information on the problem and the poor quality of the data which do exist have sharply limited our knowledge of mortality patterns in this period of Canadian history. Canada was relatively slow to establish an efficient national system of civil registration. Furthermore, provinces which instituted their own systems in earlier times had limited success in collecting accurate and reliable information (Emery, 1983). In English Canada, this problem is complicated by the lack of other resources such as parish records which have proven useful in historical demographic research. As a consequence, a definitive knowledge of past Canadian mortality patterns will no doubt remain an elusive goal. Nevertheless, there are important sources which can be used to produce estimates of the dimensions of mortality in the period before the establishment of a reliable system of vital statistics. In this paper, information contained in the Canadian censuses for the period from 1861 to 1921 will be used in an effort to draw some tentative conclusions about mortality change in the province of Ontario.

The Literature on Canadian Mortality

One of the earliest attempts to estimate the changes in Canadian mortality patterns was the work of MacLean (Dominion Bureau of Statistics, 1939). MacLean used the reports of deaths in the 1871 and 1881 censuses of Canada to construct life tables for the Canadian population. While

the results which he produced appear plausible, the data on which they are based are so inadequate that little confidence can be placed in them (Keyfitz, 1950). The authors of the census reports themselves acknowledged that the coverage was inadequate, and it seems doubtful that this source can be profitably used to produce accurate estimates of mortality levels (see also Emery, 1983).

Dissatisfaction with existing sources of data pushed later researchers to consider other approaches to the problem. Two of the most formidable students of Canadian population growth – Nathan Keyfitz (1950) and Jacques Henripin (1968) – rejected the prospect of using Canadian data and opted instead to make use of English life tables. This strategy produced reasonable results: in Keyfitz's case, to arrive at estimates of net migration and natural increase; and in Henripin's, to generate estimates of fertility. But the procedure has shortcomings for the study of mortality. It rests on the questionable assumption that the evolution of mortality in Canada followed the English trend. Moreover, it does not allow for an examination of regional differences, though there are good reasons to suspect that important differences existed, particularly between Quebec and other provinces.

A major step forward in the study of mortality was taken with the 1982 publication of Bourbeau and Légaré's analysis of the evolution of mortality by period and cohort for the country as a whole and for the province of Quebec in particular. Using a novel technique, Bourbeau and Légaré generated a series of life tables for the male and female populations. They examined the relationship between mortality levels in Canada and a series of European countries in the twentieth century during periods when good quality data were available and assumed that a similar pattern of relationship held between Canada and selected European countries during the period when reliable Canadian data were unavailable. This procedure allowed them to generate estimates of the probability of dying between ages 0 and 15 for both sexes combined and the probability of dying between ages 30 and 50 for females. These two pieces of information were used for Canada and Quebec to identify life tables for the two areas from the Ledermann model life tables.

The work of Bourbeau and Légaré has vastly increased our knowledge of Canadian mortality patterns and may well remain as the most accurate and detailed estimates of mortality for the period before the beginning of the national vital statistics system. Nevertheless, there are several reasons why it might be useful to continue experimenting with other approaches to the study of mortality. First, as with the work of

Keyfitz and Henripin, the method rests on an unprovable assumption, in this case, that the relationship between Canadian and European mortality patterns remained constant over a lengthy period of time. And second, the method does not allow for the identification of peculiar features of a region's mortality pattern. This can be of particular importance in the case of Quebec, where some evidence exists to suggest that the province suffered from infant mortality rates in excess of what would be expected given the overall level of mortality during the late nineteenth and early twentieth century (Beaujot and McQuillan, 1982; Linteau *et al.*, 1979).

Mortality Estimates Using Census Survival Rates

Past studies have not made use of the basic data contained in the Canadian censuses for the period from 1861-1921, though these censuses do contain valuable information for the study of mortality. Useful techniques have been developed, often for use in the case of developing countries with poorer quality census data than are available for Canada during this period, which can be used to estimate mortality on the basis of age-sex distributions contained in the census (United Nations, 1967).

The technique employed here involves use of the decennial censuses of Canada for the years from 1861 to 1921. For each decade, the population as recorded in the census at the beginning of the decade (t_0) was projected using the ten-year survival ratios implied by the mortality levels of the Coale-Demeny West model life tables[1] assumed to bracket the actual level of mortality experienced by the population (e.g., $e_0^o = 25, 30 \ldots 65$). The resulting series of projected populations as well as the population recorded in the census at the end of the decade (t_1) were then cumulated, starting from the oldest age group, and compared at each age. For example, the population aged 35 and over as recorded in the census was compared to the population 35 and over which would have resulted had the population experienced the mortality rates implied by the model life tables where $e_0^o = 25, 30 \ldots 65$. By interpolating between the mortality levels which produce projected populations 35 and over which bracket the population 35 and over in the census population, an estimate of the mortality level experienced by the population and, consequently, an estimate of expectation of life at birth can be obtained. A similar estimate was obtained based on the size of the observed population age x and above, relative to the size of the population age x and above in the projected populations for $x = 10, 15 \ldots 50$. The median of

the nine estimates generated by this process was accepted as the single best estimate of expectation of life at birth and was used as the base entry in the construction of life tables. (For full details on the method used, see United Nations, 1967:7-12.)

The procedure used here was developed specifically for use in situations where accurate and complete demographic data are unavailable. A strength of the method is that the results are unaffected by inaccuracies in the reporting of age, such as age heaping; inaccuracies which were undoubtedly characteristic of late nineteenth century Canadian censuses. The results of the method can be affected, however, by systematic changes in the completeness of enumeration in the censuses. Although it seems unlikely that this would have greatly affected the results of the present analysis, it is, nevertheless, a limitation that should be borne in mind when evaluating the estimates presented here. While the use of this technique for determining mortality patterns in a population possessing two or more reasonably accurate censuses is, in principle, straightforward, a number of problems arise in the case of nineteenth century Ontario. Each of these will be examined in turn.

Age Categories in the Census

A relatively minor problem which had to be dealt with concerned the reporting of ages in the various censuses. The 1861 and 1871 censuses did not report ages either by single year of age or by standard five-year age groups. To correct this problem, Sprague multipliers were used to divide the given age categories into single years of age (Shryock and Siegel, 1975:876). The resulting estimates were then regrouped to make up standard five-year age groups. It would seem unlikely that this operation introduced any significant degree of inaccuracy into the estimation process.

Migration

By far the most serious problem encountered in the process was the impact of migration on mortality estimates. The majority of techniques which have been developed to produce indirect estimates of mortality assume either that the population under study is closed or that migration into or out of the population is negligible. In many instances, such

assumptions can be made without undue harm, but such an assumption is clearly untenable in the Canadian case. In attempting to deal with this issue, two separate aspects of the problem must be addressed.

The first aspect concerns the age pattern of migration. A small amount of direct evidence is available on age differences in Canadian migration patterns during this period (Cowan, 1961; Lavoie, 1972), but it is insufficient to generate an age schedule of migration which could be used to adjust the census data for the effects of migration. Some recent work has produced model migration schedules (Rogers *et al.*, 1978; Rogers and Castro, 1981), but again insufficient information to make use of these schedules is available from the Canadian case. Thus we were forced to adopt a different strategy here. This strategy involved comparing the age structure of the female population from one census to the next and identifying the discrepancies thought to be associated with migration. (It is generally agreed that the female population was less drastically affected by migration, and thus it seemed advisable to base our analysis on the female population rather than on the male or total population.) To accomplish this, we projected the population at the earlier date using a West model life table at a reasonable level of mortality ($e_0^o = 40$ for the period 1861-1901, $e_0^o = 55$ for the period 1901-21) and then compared the projected and observed populations (Van De Walle, 1974). A pattern of discrepancies was immediately observed that was almost certainly caused by migration. It is important to note that this process was not used to generate estimates of the volume of migration but only its likely age pattern.[2] The observed discrepancies were then expressed as a percentage of the net migration.[3]

This procedure could have been performed for each decade in order to generate a unique schedule for each ten-year period. However, this procedure was not followed for several reasons. First, the last four decades of the century were characterized by a steady loss of population, and it seems reasonable to assume that no significant shift in the age pattern of migration occurred. Second, it is almost certain that the accuracy of the censuses, with respect to both coverage and age reporting, improved over time. Thus it seemed reasonable to use the age schedule generated by performing the specified operations for the decade 1891-1901 for all four decades prior to 1901.

However, this same age schedule could not be applied to the decades 1901-11 or 1911-21. As is well known, these decades marked the arrival of hundreds of thousands of European immigrants (Beaujot and McQuillan, 1982). At the same time, Canada as a whole and Ontario in par-

ticular were continuing to experience a significant outflow of migrants. The data from the censuses for these years demonstrate this fact clearly. The ten-year survival ratio for the cohort aged 20-24 in 1901 is equivalent to what would be expected in a population where female life expectancy was only 25. Given this pattern of migration — which undoubtedly combined significant flows of migrants into and out of the province — it was decided to use unique age schedules of migration for these two decades. The same procedure outlined above was used to arrive at these schedules.

The age schedule used for the last four decades of the nineteenth century is in line with the findings of other investigations of nineteenth century age patterns of migration (Van De Walle, 1974; Wrigley and Schofield, 1981). The flow of migrants rises sharply through the late teen

TABLE 1. AGE SCHEDULES OF MIGRATION FOR FEMALES, ONTARIO, 1861-1901, 1901-11, 1911-21

Age Group	1861-1901	1901-1911	1911-1921
0-4	.000	.834	.247
5-9	-.033	.508	.178
10-14	-.042	.716	.231
15-19	-.241	-.017	.153
20-24	-.359	-.761	-.027
25-29	-.182	-.169	.081
30-34	-.052	.026	.071
35-39	-.044	-.071	.027
40-44	-.024	.054	.062
45-49	-.024	-.120	-.022

NOTE: See text for explanation of procedure used. Figures are proportions of net migration estimate.

years, reaching a peak for the age group 20-24. The rates drop off sharply after age 30. The age schedules for the two decades of the twentieth century are quite different. The age schedule for 1901-11 is very erratic. The pattern suggests a substantial flow of infants and small children into the population, combined with a continuing loss of young adults. Factors other than migration could, of course, produce the observed "distortions" in the age structure of the population. It therefore seems advisable to view the results for this decade with special caution. The age schedule for the final decade of the period, 1911-21, is more in line with expectations. It shows a pattern of in-migration at all ages except for those in their early twenties, where some continued outflow occurred.

The second aspect of the migration problem concerns the volume of migration. No firm estimates of the balance of migration are available, and those estimates which have been made were arrived at by making assumptions about mortality levels using English or American life tables. However, this is not to say that we are totally in the dark concerning migration during this period. There is general agreement that the period from 1861 to 1901 was marked by a net loss of population due to migration, while the following two decades saw a positive balance for the country as a whole and for the province of Ontario (Urquhart and Buckley, 1965; Kalbach and McVey, 1979:54). Recent work has greatly increased our knowledge of fertility patterns in the period prior to the

TABLE 2. ESTIMATES OF NET MIGRATION, ONTARIO, 1861-1921

Decade	Low	Medium	High
1861-1871	-30 000	-40 000	-50 000
1871-1881	-10 000	0 000	10 000
1881-1891	-30 000	-40 000	-50 000
1891-1901	-60 000	-70 000	-80 000
1901-1911	10 000	20 000	30 000
1911-1921	10 000	20 000	30 000

beginnings of the national vital statistics system (Gee, 1979; Henripin, 1968). These data help us to make plausible estimates of the minimum and maximum rates of natural increase and hence allow us to set limits on the likely volume of migration. Nevertheless, there can be no disguising the fact that a large degree of uncertainty remains. In recognition of this, three different assumptions about the volume of migration were used to compute estimates of mortality for each decade. The assumptions used for each decade are presented in Table 2.

Results of the Analysis

Table 3 presents the three estimates of expectation of life at birth for each of the six decades from 1861 to 1921. The appendix contains abridged life tables computed using the "medium" estimate of migration. The findings suggest that life expectancy for females rose from the low- to mid- 40s just after the middle of the nineteenth century to near 50 by the turn of the century. The pace of improvement quickened thereafter, resulting in an increase of some 10 years in expectation of life at birth during the first two decades of the twentieth century. As is to be expected given the nature of the West model life tables, the figures for males are generally about three years lower than the female estimates. This steady improvement resulted in the crude death rate being halved in the space of 60 years and in a decline of over 60 per cent in the rate of infant mortality.

As is evident from Table 3, the estimates of mortality are significantly affected by variations in the assumptions about the volume of migration. This is particularly the case in the earlier years when it is generally agreed that the volume of migration relative to the size of the population was high. In the first two decades of the period, the spread between the lowest and highest estimates is more than six years, though by the final decade the gap has been reduced to less than two.

The instability in the estimates of migration suggests it would be useful to compare the results achieved by use of the census survival method with those arrived at using alternative methods. To accomplish this goal, estimates of mortality rates for Ontario were computed using a variation of the technique employed by Bourbeau and Légaré (1982) for Canada and Quebec. (To facilitate comparison with the results from the census survival method, we used the Coale-Demeny rather than the Ledermann life tables used by Bourbeau and Légaré.) The results are

TABLE 3. ESTIMATES OF EXPECTATION OF LIFE AT BIRTH FOR ONTARIO USING COALE-DEMENY MODEL LIFE TABLES

Decade	Females		
	Low	Medium	High
1861-71	40.27	43.17	46.84
1871-81	41.95	45.08	48.53
1881-91	44.78	47.63	49.90
1891-01	46.81	49.55	52.70
1901-11	52.80	54.39	55.52
1911-21	60.66	61.58	62.50
		Males	
	Low	Medium	High
1861-71	37.56	40.36	43.95
1871-81	39.00	42.20	45.64
1881-91	41.91	44.74	47.01
1891-01	43.93	46.66	49.66
1901-11	49.75	51.25	52.31
1911-21	57.10	57.97	58.85

presented in Table 4. They show expectation of life at birth for females rising from roughly 45 years in 1861 to 53 years in 1901 and to 57 years in 1921. These results are generally in line with the previous estimates, though for the period prior to 1901 they are closer to the "high" estimates computed using the census survival method, while for the years after 1901 they are closer to the "low" estimates. Thus the rapid improvement in life expectancy after 1901 suggested by the census survival method does not show up when the Borbeau-Légaré method is used. While the census survival method indicates an increase of some 10 years during these two decades, the Bourbeau-Légaré method suggests a gain of only

TABLE 4. ESTIMATES OF EXPECTATION OF LIFE AT BIRTH (e^0) FOR ONTARIO USING THE BOURBEAU-LÉGARÉ METHOD

Year	Males	Females
1861	41.84	45.60
1871	44.22	46.73
1881	45.31	48.59
1891	47.15	50.70
1901	51.44	53.29
1911	53.86	57.05
1921	55.82	57.34

four years.[4] While it is not possible to determine which set of figures presents the more accurate picture of mortality change, it is interesting to note that the age-specific death rates reported in the 1921 Vital Statistics Reports estimate the female expectation of life at birth at 59.08 — higher than the estimate calculated using the Bourbeau-Légaré method but lower than the "low" estimate of the census survival method.

As we have emphasized, the results of the present analysis must be seen as tentative. Nevertheless, it is of interest that the basic pattern of change observed here fits quite well with the findings of other inquiries into the problem. Bourbeau and Légaré's findings for the Canadian population as a whole showed that improvements in mortality came slowly but steadily throughout the last half of the nineteenth century and more rapidly in the decades after. They estimated that expectation of life at birth for females increased from 42.7 in 1861 to 50.2 by 1901. Between 1901 and 1921, a further increase of more than eight years to 58.4 was recorded.

The "medium" estimates of female life expectancy are consistently higher than the Bourbeau and Légaré estimates for the female population of Canada. The difference is generally about two years for the latter part of the nineteenth century but becomes greater after 1901. In large measure, this is to be expected. Death rates in Quebec are widely acknowledged to have been higher than the rates in the rest of the coun-

try. The separate life tables published for Quebec by Bourbeau and Légaré show life expectancy in Quebec lagging consistently behind that of Canada as a whole with the gap amounting to as much as three years in some decades.[5]

Summary and Conclusions

Taking together the results of the present analysis and those of other attempts to deal with this problem, we can feel fairly secure in arriving at a set of general conclusions. First, mortality conditions improved gradually but steadily during the period 1861-1921. Expectation of life at birth for females in Ontario rose from approximately 40 years around the middle of the nineteenth century to about 50 years by the beginning of the twentieth. A further gain of some 10 years was then achieved in the two decades that followed. In addition, mortality rates in Ontario were consistently below the national average during this period and significantly lower than rates in Quebec.

It is difficult to advance beyond these general conclusions. The lack of quality data forces researchers to make assumptions which cannot be rigorously defended. It also necessitates the use of methods which by their very nature prevent us from uncovering peculiar or distinctive features of the Canadian experience. As such, we cannot supply answers to some of the most intriguing questions about Canadian mortality. The problem of regional variations in overall mortality or in rates for specific groups such as infants are among the most interesting issues in the area, yet our inability to generate more accurate measures of mortality prevents us from drawing any firm conclusions about the nature or extent of the differentials.

While great progress has been made in recent years in the development of methods for indirect estimation, it seems unlikely we will ever be able to achieve a high level of accuracy in estimating Canadian mortality rates during the period under study. There is, however, one promising alternative approach which may allow us to acquire greater knowledge about Canadian mortality in the past. In studying local communities, a variety of data sources may allow us in the future to address issues which the aggregate data force us to pass over.

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Footnotes

1. There is considerable evidence to suggest that West model life tables are appropriate for use in the case of Ontario. First, Canadian life tables were used as input in the construction of the West model life tables (Coale and Demeny, 1966). Second, the age pattern of deaths recorded in 1921 conform closely to the West model pattern. Third, there is no evidence that Ontario experienced unusually high infant mortality such as was likely the case in Quebec, which would have made the West model life tables inappropriate.

2. It should be noted, however, that radically incorrect assumptions about the level of mortality would distort the age pattern of migration obtained. It is very unlikely that this was a problem in this case.
3. Van De Walle (1974:83) expressed the rates as percentages of the total migration. However, since there is greater agreement on estimates of net migration than there is regarding total migration, it was decided to use net migration instead.
4. The low figure estimated for 1921 may reflect a peculiarity in the estimation procedure for this year. This is the first decade for which information on the United States was available for use in the calculations, and the American figures for life expectancy were consistently the lowest of the series used.
5. The Bourbeau and Légaré estimates for Quebec do not imply extraordinarily high rates of infant mortality as has been assumed by others who have studied the Quebec situation (Copp, 1971; Groulx, 1943; Linteau *et al.*, 1979). It is thus possible that they overestimate the level of life expectancy in Quebec and underestimate the gap between Quebec and the rest of the country.

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APPENDIX. ABRIDGED LIFE TABLES FOR FEMALES, COALE-DEMENEY WEST REGION

ABRIDGED LIFE TABLE
FEMALES
COALE-DEMENY WEST REGION

1861-1871

AGE	Q(X)	D(X)	M(X)	I(X)	L(X)	S(X)	T(X)	E(X)
0	.15723	15723.	.17513	1000000.	89780.	.80832	4317106.	43.17
1	.10219	8613.	.02740	84277.	314380.	.92226	4227326.	50.16
3	.02952	2233.	.00599	75665.	372740.	.97367	3912946.	51.71
10	.02304	1692.	.00466	73431.	362927.	.97318	3540206.	48.21
15	.03070	2202.	.00624	71740.	353192.	.96532	3177279.	44.29
20	.03878	2697.	.00791	69537.	340945.	.95882	2824087.	40.61
25	.04363	2919.	.00893	66841.	326905.	.95352	2483142.	37.15
30	.04941	3158.	.01013	63921.	311710.	.94797	2156237.	33.73
35	.05479	3329.	.01127	60763.	295491.	.94262	1844527.	30.36
40	.06012	3453.	.01240	57434.	278535.	.93632	1549036.	26.97
45	.06746	3642.	.01396	53980.	260798.	.92236	1270501.	23.54
50	.08855	4458.	.01853	50339.	240550.	.89873	1009703.	20.06
55	.11522	5287.	.02445	45881.	216189.	.86030	769154.	16.76
60	.16737	6794.	.03653	40595.	185987.	.80452	552964.	13.62
65	.22923	7748.	.05178	33800.	149631.	.72731	366977.	10.86
70	.32909	8573.	.07878	26052.	108828.	.61989	217346.	8.34
75	.45615	7973.	.11819	17479.	67462.	.37834	108518.	6.21
80	1.00000	9506.	.23153	9506.	41057.	.00000	41057.	4.32

INTERCENSAL RATE OF NATURAL GROWTH = .0221
INTERCENSAL CRUDE BIRTH RATE = .0416
INTERCENSAL CRUDE DEATH RATE = .0195

ABRIDGED LIFE TABLE
FEMALES
COALE-DEMENY WEST REGION

1871-1881

AGE	Q(X)	D(X)	M(X)	I(X)	L(X)	S(X)	T(X)	E(X)
0	.14563	14563.	.16085	100000.	90534.	.82249	4508270.	45.08
1	.09331	7972.	.02486	85437.	320711.	.92908	4417736.	51.71
5	.02703	2098.	.00547	77465.	382081.	.97585	4097025.	52.89
10	.02114	1593.	.00427	75367.	372853.	.97533	3714945.	49.29
15	.02827	2037.	.00574	73774.	363654.	.96800	3342091.	45.30
20	.03582	2568.	.00730	71687.	352017.	.96193	2978437.	41.55
25	.04039	2792.	.00825	69119.	338617.	.75699	2626421.	38.00
30	.04573	3033.	.00936	66327.	324054.	.95178	2287804.	34.49
35	.05083	3217.	.01043	63294.	308429.	.94663	1963750.	31.03
40	.05605	3367.	.01153	60077.	291967.	.94039	1655321.	27.55
45	.06338	3594.	.01309	56710.	274564.	.92688	1363353.	24.04
50	.08352	4436.	.01743	53116.	254487.	.90416	1088789.	20.50
55	.10923	5320.	.02312	48679.	230097.	.36719	834302.	17.14
60	.15923	6904.	.03460	43359.	199536.	.81305	604206.	13.93
65	.21991	8017.	.04942	36455.	162234.	.73712	404669.	11.10
70	.31796	9042.	.07561	28438.	119586.	.63082	242435.	8.52
75	.44427	8617.	.11423	19396.	75437.	.38594	122850.	6.33
80	1.00000	10779.	.22734	10779.	47413.	.00000	47413.	4.40

INTERCENSAL RATE OF NATURAL GROWTH = .0180
INTERCENSAL CRUDE BIRTH RATE = .0354
INTERCENSAL CRUDE DEATH RATE = .0174

APPENDIX. ABRIDGED LIFE TABLES FOR FEMALES, COALE-DEMENEY WEST REGION (continued)

ABRIDGED LIFE TABLE
FEMALES
COALE-DEMENY WEST REGION

1881-1891

AGE	Q(X)	D(X)	M(X)	I(X)	L(X)	S(X)	T(X)	E(X)
0	.13096	13096.	.14314	100000.	91488.	.84057	4763388.	47.63
1	.08207	7132.	.02169	86904.	328795.	.93764	4671901.	53.76
5	.02401	1915.	.00486	79772.	394072.	.97860	4343105.	54.44
10	.01873	1458.	.00378	77857.	385639.	.97805	3949033.	50.72
15	.02524	1928.	.00511	76399.	377173.	.97138	3563394.	46.64
20	.03208	2389.	.00652	74471.	366380.	.96587	3186221.	42.78
25	.03624	2612.	.00738	72081.	353876.	.96139	2819840.	39.12
30	.04106	2853.	.00838	69469.	340213.	.95660	2465964.	35.50
35	.04583	3053.	.00938	66616.	325450.	.95170	2125751.	31.91
40	.05089	3235.	.01044	63564.	309731.	.94554	1800301.	28.32
45	.05822	3512.	.01199	60329.	292864.	.93259	1490569.	24.71
50	.07716	4384.	.01605	56817.	273123.	.91103	1197705.	21.08
55	.10177	5336.	.02145	52433.	248822.	.87591	924582.	17.63
60	.14893	7014.	.03218	47096.	217946.	.82385	675760.	14.35
65	.20813	8342.	.04646	40032.	179555.	.74955	457814.	11.42
70	.30390	9646.	.07167	31740.	134585.	.64466	278259.	8.77
75	.42925	9434.	.10931	22094.	86761.	.39612	143674.	6.50
80	1.00000	12610.	.22157	12610.	56912.	.00000	56912.	4.51

INTERCENSAL RATE OF NATURAL GROWTH = .0140
INTERCENSAL CRUDE DEATH RATE = .0301
INTERCENSAL CRUDE DEATH RATE = .0161

ABRIDGED LIFE TABLE
FEMALES
COALE-DEMENY WEST REGION

1891-1901

AGE	Q(X)	D(X)	M(X)	I(X)	L(X)	S(X)	T(X)	E(X)
0	.12052	12052.	.13076	100000.	92166.	.85353	4954565.	49.55
1	.07407	6515.	.01947	87948.	334600.	.94366	4862399.	55.29
5	.02182	1777.	.00441	81433.	402724.	.98055	4527799.	55.60
10	.01702	1355.	.00343	79656.	394893.	.97998	4125075.	51.79
15	.02307	1806.	.00467	78301.	386989.	.97379	3730182.	47.64
20	.02942	2251.	.00597	76495.	376847.	.96867	3343194.	43.70
25	.03329	2472.	.00677	74244.	365042.	.96452	2966347.	39.95
30	.03775	2709.	.00769	71773.	352089.	.96004	2601305.	36.24
35	.04226	2919.	.00864	69063.	338019.	.95531	2249216.	32.57
40	.04722	3123.	.00967	66144.	322913.	.94921	1911197.	28.89
45	.05454	3437.	.01121	63021.	306512.	.93666	1588283.	25.20
50	.07264	4328.	.01508	59584.	287098.	.91591	1281772.	21.51
55	.09643	5328.	.02026	55256.	262957.	.88212	994674.	18.00
60	.14161	7070.	.03048	49927.	231961.	.83154	731717.	14.66
65	.19975	3561.	.04438	42857.	192884.	.75840	499756.	11.66
70	.29389	10079.	.06890	34296.	146284.	.65452	306873.	8.95
75	.41856	10136.	.10587	24217.	95745.	.40379	160588.	6.63
80	1.00000	14081.	.21715	14081.	64843.	.00000	64843.	4.61

INTERCENSAL RATE OF NATURAL GROWTH = .0108
INTERCENSAL CRUDE BIRTH RATE = .0262
INTERCENSAL CRUDE DEATH RATE = .0154

APPENDIX. ABRIDGED LIFE TABLES FOR FEMALES, COALE-DEMENEY WEST REGION (continued)

ABRIDGED TABLE
FEMALES
COALE-DEMENY WEST REGION

1901-1911

AGE	Q(X)	D(X)	M(X)	I(X)	L(X)	S(X)	T(X)	E(X)
0	.09630	9630.	.10273	100000.	93741.	.88550	5439020.	54.39
1	.05230	4726.	.01354	90370.	349007.	.95927	5345280.	59.15
5	.01636	1401.	.00330	85644.	424716.	.98548	4996272.	58.34
10	.01266	1066.	.00255	84243.	418547.	.98467	4571556.	54.27
15	.01804	1501.	.00364	83176.	412129.	.97925	4153009.	49.93
20	.02351	1920.	.00476	81675.	403576.	.97486	3740880.	45.80
25	.02680	2138.	.00543	79755.	393432.	.97143	3337304.	41.84
30	.03038	2358.	.00617	77618.	382192.	.96765	2943872.	37.93
35	.03438	2587.	.00700	75259.	369828.	.96326	2561680.	34.04
40	.03919	2848.	.00800	72672.	356240.	.95712	2191852.	30.16
45	.04672	3262.	.00957	69824.	340964.	.94530	1835612.	26.29
50	.06307	4198.	.01302	66562.	322314.	.92617	1494648.	22.46
55	.08532	5321.	.01782	62364.	298516.	.89503	1172334.	18.80
60	.12644	7213.	.02700	57043.	267182.	.84723	873818.	15.32
65	.18291	9115.	.04027	49830.	226364.	.77610	606636.	12.17
70	.27407	11159.	.06352	40716.	175681.	.67406	380272.	9.34
75	.39740	11746.	.09919	29557.	118419.	.42119	204591.	6.92
80	1.00000	17811.	.20669	17811.	86172.	.00000	86172.	4.84

INTERCENSAL RATE OF NATURAL GROWTH = .0103
INTERCENSAL CRUDE BIRTH RATE = .0235
INTERCENSAL CRUDE DEATH RATE = .0132

ABRIDGED LIFE TABLE
FEMALES
COALE-DEMENY WEST REGION

1911-1921

AGE	Q(X)	D(X)	M(X)	I(X)	L(X)	S(X)	T(X)	E(X)
0	.06392	6392.	.06669	100000.	95845.	.92650	6157812.	61.58
1	.02845	2663.	.00725	93608.	367403.	.97688	6061967.	64.76
5	.00961	874.	.00193	90945.	452538.	.99144	5694563.	62.62
10	.00749	675.	.00150	90071.	448666.	.99073	5242025.	58.20
15	.01107	989.	.00223	89396.	444506.	.98712	4793358.	53.62
20	.01472	1301.	.00297	88407.	438781.	.98411	4348852.	49.19
25	.01708	1487.	.00344	87106.	431810.	.98162	3910071.	44.89
30	.01971	1687.	.00398	85618.	423873.	.97860	3478262.	40.63
35	.02313	1941.	.00468	83931.	414801.	.97455	3054389.	36.39
40	.20783	2282.	.00564	81989.	404243.	.96841	2639588.	32.19
45	.03546	2827.	.00722	79708.	391472.	.95771	2235345.	28.04
50	.04936	3795.	.01012	76881.	374918.	.94099	1843873.	23.98
55	.06916	5055.	.01433	73086.	352793.	.91381	1468956.	20.10
60	.10448	7108.	.02205	68031.	322385.	.87036	1116163.	16.41
65	.15774	9610.	.03425	60923.	280590.	.80277	793778.	13.03
70	.24412	12527.	.05561	51313.	225248.	.70353	513187.	10.00
75	.36571	14185.	.08951	38786.	158470.	.44964	287939.	7.42
80	1.00000	24602.	.19002	24602.	129469.	.00000	129469.	5.26

INTERCENSAL RATE OF NATURAL GROWTH = 0153
INTERCENSAL CRUDE BIRTH RATE = .0253
INTERCENSAL CRUDE DEATH RATE = .0100