

BIRTH-RATE AND DEATH-RATE IN NEW ZEALAND.

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Of all British colonies New Zealand is the one that most closely resembles Great Britain in size, in situation, and in climate. And the inhabitants of the two countries are of practically the same race. The vital statistics of New Zealand are therefore eminently suitable for comparison with those of Great Britain. In the present paper comparison has been restricted to the birth-rates and death-rates, and in this limited survey several points of interest present themselves.

Before proceeding farther, it is well to consider the trustworthiness of the data, in other words the accuracy of the New Zealand birth-rates and death-rates. The New Zealand rates mentioned in this paper are for the most part those officially published by the Registrar-General for the colony, and they may be assumed to represent the truth, provided that the fundamental data are correct. For the accuracy of birth-rates and death-rates depends on two factors, viz. the completeness of the registration of births and deaths, and the correctness of the calculation of the population.

1. *The completeness of the registration of births and of deaths* cannot be tested, but there is reason to suppose that registration is fairly complete in New Zealand, where for many years all statistical returns have been carefully and fully recorded.

2. *The calculation of the population.* There is in New Zealand a five-yearly census, as contrasted with the ten-yearly census which is

the rule in most other countries. There must be some unavoidable error in estimating by any method the population of a country during inter-censal periods, but frequent census enumerations reduce this error to a minimum. Further, in New Zealand accurate returns of immigration and emigration are available, and the population for inter-censal years is calculated by adding to the number enumerated at the last census the excess of immigration over emigration, and the excess of births over deaths. This method has been found to give very accurate results when checked by the five-yearly census.

A few more facts regarding the population of New Zealand are worthy of consideration.

1. *Number of the population.* Though New Zealand has been inhabited by English-speaking people for only a little more than sixty years, the present population is large enough to provide birth-rates and death-rates free from those temporary variations which are found in dealing with small populations. Thus whilst the first census of New Zealand, taken November 1st, 1851, showed that the population was only 26,707, the last census of March 31st, 1901, gave a total of 772,719. It is to be noted that the above figures, as well as the birth-rates and death-rates mentioned later, refer only to the "European" population of New Zealand: this excludes the natives or Maoris, but includes a few Chinese and other Asiatics as well as all of European birth.

2. *Nationality.* As regards nationality, determined by birthplace, the census of 1901 showed that of the whole European population of New Zealand 97.43% were of British birth, 67% being New Zealand born, and 26.56%¹ born in the United Kingdom: only 2.41% were of foreign birth.

3. *Age and Sex Distribution of the Population.* This is important on account of the effect it has on the birth- and death-rates. In brief, there is in New Zealand as compared with England and Wales,

- (a) A deficiency of people at higher ages.
- (b) A deficiency of females.

Both these peculiarities are due to immigration and other conditions of colonial life, and they are becoming less marked as the conditions of life in New Zealand are approximating more nearly to those obtaining in Great Britain. Thus the proportion of old people in the New Zealand population is increasing, as shown in the following table:—

¹ One of these percentages is incorrect, but a rectification is impossible because of the author's absence from England.—Ed.

TABLE 1.

New Zealand	
Year	Persons 65 years and upwards per cent. of population
1864	0·63
1871	1·08
1881	1·41
1891	2·29
1896	2·95
1901	4·06

As regards sex distribution, the increasing proportion of females is shown by the following table:—

TABLE 2.

New Zealand	
Year	Number of females to 100 males
1861	62·16
1871	70·52
1881	81·72
1891	88·26
1896	89·31
1901	90·33

The effect of these changes in the age and sex distribution of the New Zealand population will be referred to later.

In the meantime we may conclude that the New Zealand birth- and death-rates are trustworthy, being calculated from data which are fairly accurate.

BIRTH-RATES.

I. *Crude Birth-rates.*

1. *General Birth-rate* or number of births per 1000 of the population: It is obvious that this rate will be affected by the number of women, and especially married women, of child-bearing ages, in proportion to the rest of the population. Thus New Zealand,

whose population when compared with that of England and Wales shows a relative deficiency of females, will for this reason alone have a lower general birth-rate—other conditions being equal. This error may be eliminated by calculating corrected birth-rates, where the number of births is expressed proportionately to 1000 women of child-bearing age. The relative values of crude and of corrected birth-rates will be discussed later, but it may safely be asserted that the general birth-rate, though a crude, uncorrected rate, is for many purposes of extreme importance.

The following table gives the general birth-rate in New Zealand and in certain other countries:—

TABLE 3.

Birth-rate per 1000 of Population					
Year	New Zealand	Victoria	England and Wales	Ireland	France
1880	40·78	—	34·2	24·7	24·6
1885	34·35	—	32·9	23·5	24·3
1890	29·44	33·60	30·2	22·3	21·8
1895	26·78	28·57	30·2	23·2	21·7
1899	25·12	26·71	29·1	22·9	21·9
1900	25·60	25·82	28·7	22·7	21·4
1901	26·34	25·77	28·5	22·7	22·0

This table will suffice to show that the New Zealand birth-rate has fallen very rapidly during the last twenty years, till in the year 1900 it was lower than the birth-rate of any other Australasian colony, and lower than that of any European country save Ireland and France, two countries which are notorious for their low birth-rate.

2. *Illegitimate Births*: If we adopt the usual though unsatisfactory method of stating illegitimate births in proportion to total births, it will be found that whilst the general birth-rate is falling the proportion of illegitimate births is rising in New Zealand, as in other countries.

TABLE 4.

Proportion of Illegitimate Births in every Hundred Births							
Year	New Zealand	Queensland	New S. Wales	Victoria	S. Australia	W. Australia	Tasmania
1888	3·05	4·13	5·08	4·80	2·67	—	3·62
1890	3·30	4·85	5·26	5·09	2·50	—	4·05
1895	4·50	4·93	6·51	5·33	3·13	4·47	4·97
1900	4·63	6·40	7·01	5·91	4·24	4·82	5·43
1901	4·57	5·93	7·16	5·58	—	—	—

It may easily be shown, however, that this is but an apparent increase of illegitimacy. Thus in New Zealand in the year 1886 there were 602 illegitimate births, in 1896 there were 834 illegitimate births, an increase of 38·5 %. But during the same decennium the number of unmarried women aged 15 to 45 years increased from 52,348 to 85,105, or at the rate of 62·6 %. There was therefore in reality a considerable reduction in the amount of illegitimacy: the same conclusion will be derived from a study of the corrected illegitimate birth-rate (see later, Table 7).

But, making use of the available returns, it may be noted that the proportion of illegitimate to total births is not high in New Zealand as compared with many other countries. The following table gives the average results for a period of five years:—

TABLE 5.

Country	Percentage of Illegitimate to Total Births
New Zealand	4·42
New South Wales	6·88
Victoria	5·55
Queensland	5·94
South Australia	3·76
West Australia	5·06
Tasmania	5·65
England and Wales	4·15
Ireland	2·65
Scotland	6·97
Germany	9·21
Austria	14·55
France	8·26

II. *Corrected Birth-rates.*

A more accurate method of expressing the birth-rate is to give,

1. The proportion of legitimate births per 1000 married women, aged 15—45 years: the legitimate birth-rate.
2. The proportion of illegitimate births per 1000 unmarried women, aged 15—45 years: the illegitimate birth-rate.

1. *The Legitimate Birth-rate*: This is the more important of these two corrected rates, and it may be used as a fair mode of comparing the birth-rates of two different countries since it avoids fallacies due to differences in the age and sex distribution of the populations. The following table gives the legitimate birth-rate for New Zealand and for England and Wales in certain years:—

TABLE 6.

Legitimate Birth-rate per 1000 Married Women 15—45		
Year	New Zealand	England and Wales
1878	337·2	—
1881	313·3	285·6
1886	295·5	—
1891	276·3	268·0
1896	252·1	—
1901	243·8	—

This table shows that the birth-rate is falling rapidly in New Zealand, in confirmation of the evidence of the crude general birth-rate (see Table 3). But also it may be shown that there is a difference in the results given by the crude general birth-rate and the corrected legitimate rate. Taking the year 1891 as an example, reference to Table 6 demonstrates that in this year the corrected legitimate birth-rate was *higher* in New Zealand than in England and Wales (276·3 as contrasted with 268·0): but in the same year the crude general birth-rate was *lower* in New Zealand than in England (29·01 as contrasted with 31·4).

Both rates are of value, but for different purposes. The corrected legitimate birth-rate is rightly employed when it is desired to compare the fecundity of the child-bearing portion of the population in two countries, the crude general birth-rate on the other hand must be used if we wish to compare the fecundity of the whole populations. Thus in the year 1891 the married women of child-bearing age showed a greater fecundity in New Zealand than in England; yet, owing probably for the most part to the relative deficiency of females in the colony, the general birth-rate, the measure of national fecundity, was lower in New Zealand than in England. It is almost certain that what was true for 1891 held good also for earlier and later years. Hence in noticing that the general birth-rate has for some years been lower in New Zealand than in England, we must remember that the relative deficiency of females in the colony has contributed to cause the low birth-rate. This factor is, however, of diminishing importance: for we have already seen (Table 2) that in New Zealand the proportion of females to males is steadily increasing.

2. *Illegitimate Birth-rate*, or number of illegitimate births per 1000 unmarried women, aged 15—45 years.

The following table gives the rates for New Zealand and for England and Wales in certain years :—

TABLE 7.

Illegitimate Birth-rate per 1000 Unmarried Women aged 15—45		
Year	New Zealand	England and Wales
1881	—	14·1
1886	11·50	—
1891	—	10·6
1896	9·79	—
1901	9·01	—

This table (1) shows that the illegitimate birth-rate is about the same in New Zealand as in England and Wales, confirming the crude returns of Table 5.

(2) disproves the apparent increase of illegitimacy as shown in the crude figures of Table 4. In fact the illegitimate birth-rate in New Zealand is falling even more rapidly than the legitimate rate, as appears from the following table :—

TABLE 8.

New Zealand				
Year	Illegitimate Birth-rate	Rate of fall	Legitimate Birth-rate	Rate of fall
1886	11·50	} 14·7 % *	295·5	} 14·6 % †
1896	9·79		252·1	
1901	9·01	} 8·0 "	243·8	} 3·2 "

* or 7·35 % for 5 years.

† or 7·3 % for 5 years.

SUMMARY.

We conclude therefore that in New Zealand,

- (1) The crude general birth-rate is very low, and is still falling.
- (2) The corrected legitimate birth-rate, though not quite so low (e.g. when compared with the corresponding rate in England and Wales), is nevertheless still falling.

(3) The corrected illegitimate birth-rate is falling even more rapidly.

III. *Causes of the Decline of the Birth-rate in New Zealand.*

It is not proposed to discuss these at any length, as the causes acting in New Zealand are apparently the same as those which have produced a fall in the birth-rate of all civilised countries. In brief, these causes are economic and social. It seems an almost universal rule that when people grow wealthy the birth-rate falls. Thus in any individual country the birth-rate is lower in the richer classes than it is in the poor or working classes; and the same is true in the history of nations, when the country grows wealthy the birth-rate falls. Wealth and prosperity lower the birth-rate in several ways: by causing people to delay marriage till later in life—or to avoid it altogether, and especially by leading to a voluntary avoidance of child-bearing on the part of married people.

In New Zealand, though there are none of inordinate wealth, there are on the other hand none or practically none in abject poverty, and the average man is distinctly well off as regards the necessaries or even the luxuries of life. The average of comfort and wealth has increased, till now it is perhaps higher than in most other countries. Probably it is to this increase in wealth that we must ascribe the fall in the New Zealand birth-rate.

IV. *Effect of the Decline of the Birth-rate.*

The population of a country is increased either by immigration or by the natural increase of excess of births over deaths. In New Zealand during the period 1885—1901 (inclusive), the population increased by 223,953, of which 208,213 or 92.9% was from excess of births over deaths, whilst only 15,740 or 7.02% was from excess of immigration over emigration. It is clear then that the important factor determining the increase of population in New Zealand is the natural increase by excess of births over deaths, and consequently the decline that has taken place in the birth-rate has seriously interfered with the increase of population. From a national point of view this is a calamity, and especially in a young colony where an increase of population is greatly desired.

It will be pointed out in the next section that the New Zealand death-rate is extremely low, being 9.8 for the ten years 1891—1900.

This low death-rate has to some extent counteracted the effect of the falling birth-rate; but we shall see that in all probability the death-rate will rise within the next few years, and if the birth-rate continues to fall, then the rate of natural increase in New Zealand will be seriously diminished.

The gravity of this contingency will be better appreciated by means of the following comparison. France has for some years been notorious as the nation which on account of a low birth-rate has failed to increase her population at the same rate as the other great Powers of Europe. The rate of natural increase in France has gradually diminished till it has become a negative quantity. This has naturally excited considerable alarm, and attempts are being made to improve the situation:

DIAGRAM I.

France (after Dr J. Bertillon). Birth-rates - - - - - . Death-rates ———.

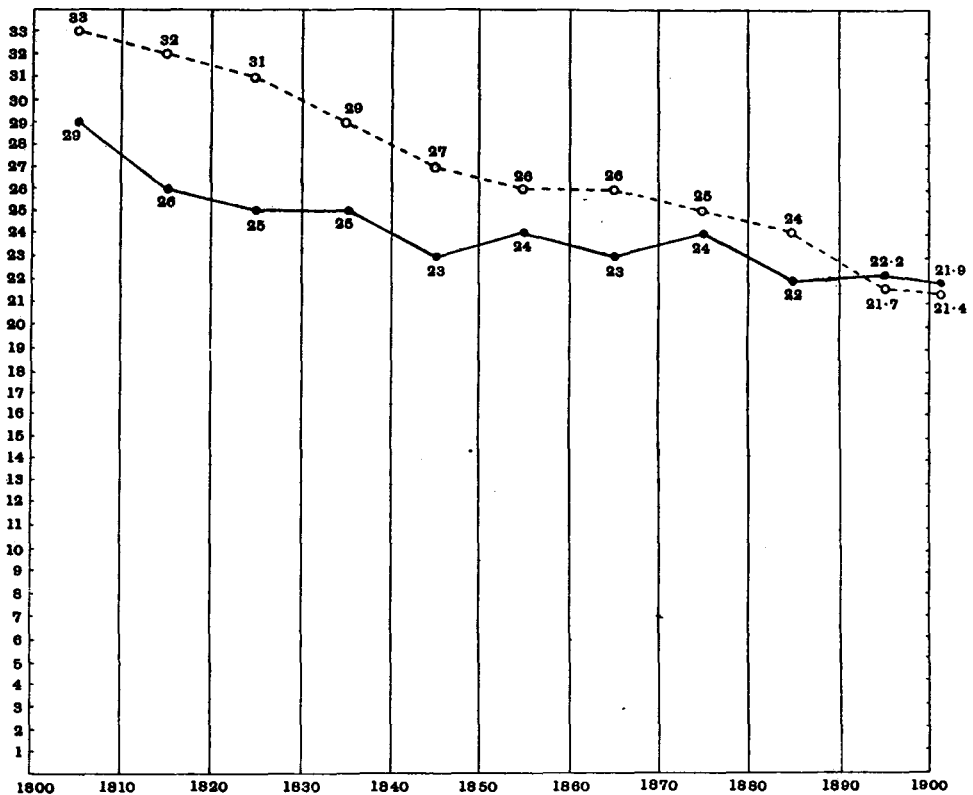
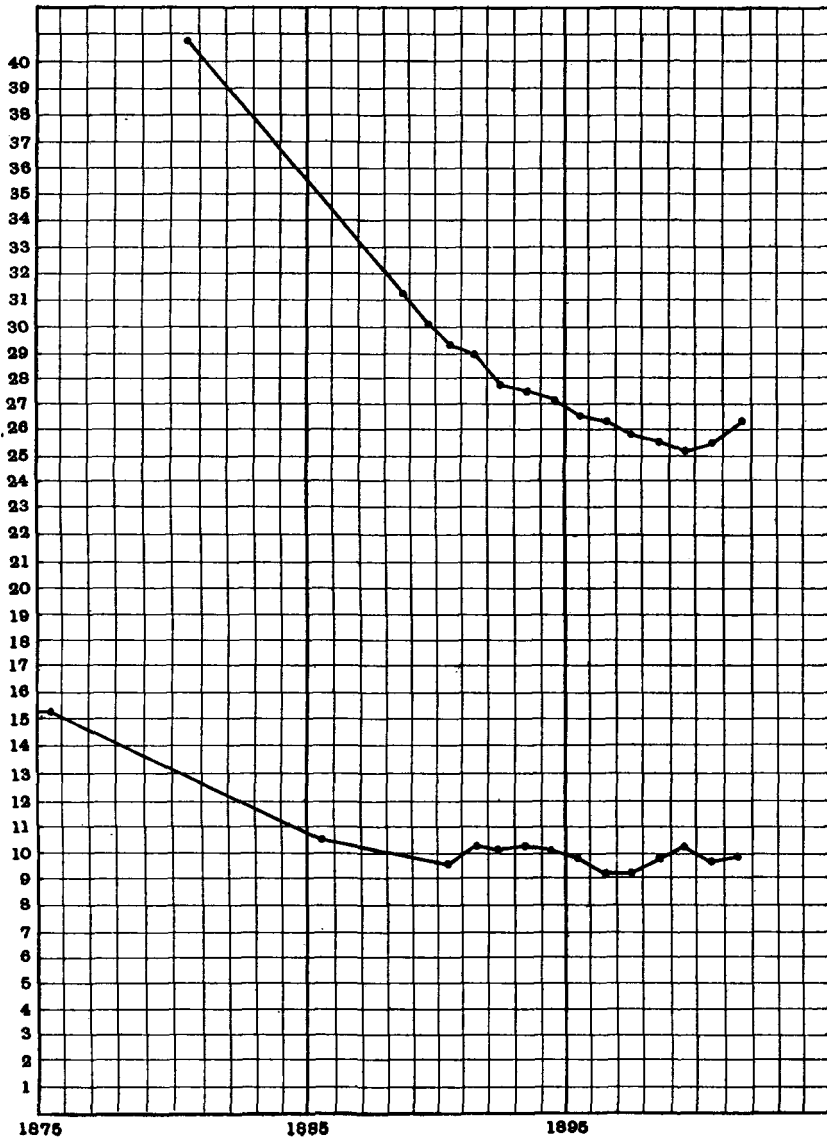


DIAGRAM II.

New Zealand. Birth-rates, above. Death-rates, below.



inter alia, a Society (L'Alliance nationale pour l'accroissement de la population française) has been formed to promote an increase of the population. The president of this Society, Dr J. Bertillon⁽¹⁾, asserts that France is being depopulated by the lowness of the birth-rate, to the detriment of the nation in matters military, commercial and intellectual. He maintains that "population is the source of all wealth, because all wealth originates in work which is produced by the hands or brains of men. In order that a country may be prosperous in every sense of the word, that it may be rich, powerful and intelligent, it must have a numerous population." Dr Bertillon also suggests a remedy for this depopulation, viz. that a tax be imposed on bachelors over thirty years of age and also on married people who have less than three children, on the other hand those having more than three children are to be exempted from taxation.

The preceding diagrams show graphically the relative condition of birth-rate and death-rate in France and in New Zealand.

In each of these diagrams the upper line indicates birth-rate, the lower line death-rate; and the intervening space represents the rate of natural increase. It will be noticed that in France the birth-rate has actually fallen below the death-rate. In New Zealand it is true there is still a large surplus of natural increase, but this is due solely to the remarkably low death-rate, which probably cannot long remain at its present low level. Even under present conditions it would need only two or three decades for the curves of birth-rate and death-rate to meet, and this calamity would be hastened were the death-rate to rise.

We conclude, therefore, that as regards increase of population in New Zealand, the outlook for the future is not satisfactory, and that it is the duty of the vital statistician to give timely warning by pointing out the facts and the consequences that must ensue.

DEATH-RATES.

I. *Crude Death-rates.*

By this is understood the number of deaths annually per 1000 of population. The crude death-rate for New Zealand is remarkably low, and, as in most other countries, it is still falling.

TABLE 9.

New Zealand	
Year	Crude Death-rate
1855	12·63
1865	14·46
1875	15·19
1885	10·57
1895	9·91
1900	9·43
1901	9·81

For purposes of comparison the mean crude death-rate for the ten years 1891-1900 has been calculated for New Zealand and for certain other countries, as given in the following table:—

TABLE 10.

Country	Crude Death-rate 1891--1900
New Zealand	9·8
Queensland	12·2
New South Wales	12·2
Victoria	13·9
South Australia	11·9
West Australia	15·7
Tasmania	12·5
England and Wales	18·1
Scotland	18·4
Ireland	18·2
France	21·5
Germany	22·2

These crude death-rates are not, however, free from fallacy. For it is well known that the death-rate varies greatly with the age and sex distribution of the population. Young children and old people have higher death-rates than adults of middle age, and males have at almost all ages higher death-rates than females. Consequently the crude death-rate is not a fair index of the mortality of a country during a period of years, unless it can be shown that the age and sex distribution of the population has remained unchanged. And if we wish to compare the crude death-rate of one country with that of another, the

population of the two countries should be the same as regards age and sex composition.

It has already been pointed out that the New Zealand population is altering in composition both as regards sex and as regards age. There has been an increase in the proportion of old people, but a decrease in the number of young children as well as an increase in the number of females. These alterations in the composition of the population are due partly to the diminishing effect of immigration, partly to the falling birth-rate, and partly to the natural increase in age of a population which formerly contained very few old people. The effect of these changes has probably been to slightly lower the death-rate: the increase in the proportion of females, and the decrease of young children, would both produce this effect, which probably is not yet counterbalanced by the increased proportion of old people. It is probable, however, that the changes taking place in the age distribution of the New Zealand population will in time produce a higher crude death-rate, in spite of the increasing proportion of females. For whilst there is naturally an increasing number of old people, there must also soon be a diminished proportion of young adults if the birth-rate continues to fall.

The effect of birth-rate on death-rate has been greatly disputed, but a full consideration of the subject will show that,

(1) A fall in the birth-rate will for a time reduce the death-rate but will ultimately increase it.

(2) A rise in the birth-rate will for a time increase the death-rate but will ultimately reduce it.

Probably the New Zealand death-rate has been and still is lowered by the change that has taken place in the birth-rate, but if the present condition of the birth-rate is maintained the opposite effect will be felt and the death-rate will rise.

As regards comparison of the crude birth-rate of New Zealand with that of England and Wales. The New Zealand population differs considerably in age and sex distribution from that of England. Thus taking the population in the census year 1896, we find that the New Zealand population, when compared with that of England and Wales according to the standard million 1881-90, showed

(1) Less numbers of both sexes at the extremes of life, ages 0-5 and 65+.

(2) Less numbers of females at all ages over 25 years.

The total effect of these differences was to lower the New Zealand death-rate; the exact amount of lowering is shown later.

II. *Corrected Death-rate.*

It is evident from the above that the crude death-rate does not provide a strictly fair method of indicating the changes in the rate of mortality of a country, or of comparing the rates of mortality in two different countries. Correction for age and sex distribution of the population is necessary. This may be accomplished either by exhibiting in tabular form the death-rates for each sex at age-periods of five or ten years, or by calculating a single corrected death-rate for the whole population.

I. *Death-Rates at Different Age-Periods.*

TABLE 11.

Age	Death-rate per 1000 living at each age-period					
	Males					
	New Zealand			England and Wales		
	1874,—78—81	1880—92	1891—96	1871—80	1881—90	1891—1900
0—5	33·56	29·09	28·83	68·14	61·6	60·8
5—	4·11	3·37	2·84	6·67	5·4	4·2
10—	2·61	2·21	2·17	3·69	3·0	2·4
15—	3·63	3·80	3·43	5·23	4·3	3·8
20—	4·96	5·39	4·89	7·32	5·7	5·2
25—	5·85	5·83	5·12	9·30	7·8	7·0
35—	9·58	8·31	7·40	13·74	12·4	11·9
45—	15·53	13·44	12·57	20·05	19·4	19·4
55—	26·08	25·33	24·65	34·76	34·7	35·8
65—	47·83	52·16	51·41	60·57	70·4	69·0
75+	107·45	—	130·80	169·08	162·2	?
	Females					
0—5	29·26	24·75	23·55	58·10	52·0	50·9
5—	3·67	2·85	2·76	6·20	5·3	4·2
10—	2·54	2·18	1·91	3·70	3·1	2·5
15—	3·43	3·62	3·46	5·43	4·4	3·7
20—	4·75	4·87	4·66	6·78	5·5	4·6
25—	6·75	6·12	5·40	8·58	7·4	6·3
35—	8·62	8·15	7·18	11·58	10·6	9·9
45—	12·06	10·84	10·13	15·59	15·1	14·9
55—	17·90	19·13	19·04	28·54	28·5	29·0
65—	42·58	42·80	43·52	60·82	60·1	60·0
75+	117·8	—	114·05	155·83	147·3	?
Columns	1	2	3	4	5	6

- Column 1. From data of Newman and Frankland⁽²⁾.
- „ 2. Leslie⁽³⁾.
- „ 3. W. J. Barclay.
- „ 4, 5, 6. Registrar-General for England and Wales.

The results shown in this table are free from fallacy of age and sex distribution, and from them we conclude,

a. The death-rates are falling in New Zealand as in England and Wales, for both sexes and at practically every age-period.

b. The death-rates are considerably lower in New Zealand than in England and Wales.

2. *Single Corrected Death-rate.*

This expresses the same results in a more concise form. I have calculated a corrected death-rate for New Zealand during the year 1896, a census year. The sum total of the population was distributed amongst the various age-groups of the two sexes, not in the proportions which actually obtained in New Zealand, but according to the proportions which existed in the population of England and Wales during the period 1881-90 as given in the standard million of the Registrar-General. Knowing the actual death-rates recorded for each age-group in New Zealand during the year 1896, we can calculate the number of deaths that would have occurred at each age-group had the age and sex distribution of the New Zealand population coincided with that of England and Wales; and by addition we obtain the total number of deaths that would have occurred in New Zealand under the same conditions.

In this manner was obtained for New Zealand during the year 1896 a corrected death-rate of 10·382 per 1000, as contrasted with the crude death-rate of 9·10. Hence it is evident that the composition of the colonial population is such as of itself to give a death-rate which is too low when compared with that of England and Wales.

Yet even when correction is made for this factor, the New Zealand death-rate remains extremely low, viz. 10·382 for 1896. Compare also the rates in Table 11.

Cause of the Low Death-rate in New Zealand.

Two factors are concerned, viz. the people, and their environment.

1. *The People.* Are the inhabitants of New Zealand in themselves particularly healthy? Probably they are. For New Zealand was originally populated by a picked class of men and women: none but the strong and energetic would be likely to face the trials and hardships of early colonial life, especially in a colony so far distant from the mother

country. Some of these original colonists still survive, and in any case their immediate descendants may be presumed to have inherited vitality above the average seen in older countries. On the other hand an element of an opposite nature has been at work, especially of late years. The reputation of the New Zealand climate has attracted a considerable number of invalids, particularly those suffering from phthisis. Some of these, a minority, do not long survive, and their deaths help to unduly increase the death-rate of the colony. And, what especially concerns us here, the majority who do survive cannot be considered a healthy class. Probably, however, the original healthy colonists still have a preponderating influence.

But it is evident that this cannot be the sole cause of the low death-rate in New Zealand, since other colonies have had equally favourable beginnings. The country itself is partly responsible, the above-mentioned second factor of environment.

2. *Environment.* This is to be considered in the widest possible sense, including Climate, Social and Industrial Conditions of Life. In a paper published in 1883, Newman and Frankland⁽²⁾ maintained that in New Zealand there were the following causes for the low death-rate:

1. The struggle for existence is easier: good food and clothing are readily obtained.

2. A large proportion of the population are engaged in agriculture and other out-door occupations.

3. The population is sparse, no overcrowding of towns.

4. There are fewer manufactures and mines, hence less industrial disease.

5. The climate is temperate, and the soil unpolluted.

These causes may perhaps be divided into two main groups, (a) Climate, and (b) Industrial and Social Conditions.

(a) *Climate.* The climate of New Zealand, though exhibiting considerable variations according to locality, is on the average extremely temperate and equable. There are no great extremes of heat or cold, and prolonged droughts are unknown. There are no new diseases to be acquired by immigrants.

(b) *Industrial and Social Conditions.* The census returns show that in New Zealand a large proportion of the population is engaged in agricultural and pastoral work. These are undoubtedly healthy occupations, and especially in a climate so equable as that of New Zealand.

There can be no doubt that the average inhabitant of New Zealand has better food, house accommodation and clothing than his fellows in older countries. It is true that there is in the colony a certain amount of poverty, but this is assuredly much less than, *e.g.* in England and Wales, where no less than 20% of the population is estimated to be living in a state of poverty.

We conclude that the following causes may be assigned for the low death-rate of New Zealand:—

1. Natural healthiness of the people.
2. Climate.
3. Favourable industrial and social conditions.

Life Table.

The preceding results based on the death-rates of New Zealand are confirmed by a Life Table for that country which the writer has calculated, based on the statistics for 1891–95. This life-table is published in *Public Health* (Oct. 1903), and it is only necessary to give here a few of the salient points. The male expectation of life at birth in New Zealand was 55·21 years as compared with 44·17 years in England and Wales (1891–1900), and with 40·98 years in London (1891–1900).

In females the expectation of life at birth in New Zealand was 57·79 years as compared with 47·82 in England and Wales, and 45·33 years in London. The expectations of life at higher ages, which are consistently greater in New Zealand than in England and Wales or in London, are given in the paper above referred to.

Although this factor does not cover the entire ground, there is every reason for ascribing the superiority of the New Zealand statistics mainly to its lower infantile mortality. The following comparative table of rates of infantile mortality brings out this point.

TABLE 12.

Rate of Infantile Mortality, or Deaths under 1 yr. per 1000 Births		
Year	New Zealand	England and Wales
1896	77·315	148
1897	72·263	156
1898	79·662	160
1899	95·885	163
1900	75·156	154
1901	71·397	166

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