

U. S. DEPARTMENT OF LABOR
JAMES J. DAVIS, Secretary
CHILDREN'S BUREAU
GRACE ABBOTT, Chief

INFANT MORTALITY
AND PREVENTIVE WORK
IN NEW ZEALAND

By
ROBERT MORSE WOODBURY, Ph. D.

Bureau Publication No. 105



WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

MCH Collection
Document Number 111

**This page is blank in the
original document.**

2360 III

CONTENTS.

	Page.
Letter of transmittal.....	v
Infant mortality in New Zealand and elsewhere.....	1-7
Comparison with the United States.....	2
Comparison with American cities studied by the Children's Bureau.....	4
Analysis of statistics of infant mortality, New Zealand.....	8-12
Decline in infant mortality, 1872-1919.....	8
Decline in infant mortality in cities.....	8
Decline in infant mortality, by cause of death.....	9
Birth and death registration.....	13-16
Notification and registration of births.....	13
Registration of deaths.....	14
Completeness of birth and death registration.....	14
Relation between general conditions and infant mortality.....	17-27
Climate.....	17
Racial composition of population.....	19
Literacy.....	20
Density and distribution of population in city and country.....	20
Housing congestion.....	21
Birth rate.....	23
Proportion of illegitimate births.....	24
Economic level of the population.....	24
Government activities relating to the welfare of mothers and infants.....	27-46
General health protection.....	28-31
Organization of the department of health.....	28
Sanitation and prevention of infectious diseases.....	29
Social hygiene.....	30
Government aid in health protection.....	30
Regulation of medical and nursing services.....	31-35
Registration of medical practitioners.....	31
Registration of nurses.....	33
Registration of midwives.....	33
Hospitals.....	35-38
St. Helen's Maternity Hospitals.....	35
Public general hospitals.....	37
Private hospitals.....	37
Control over milk supply.....	38-41
Regulation of production of milk.....	38
Regulation of sale of milk.....	39
Wellington municipal milk.....	40
Maternity allowances.....	41
Regulation of boarding homes for infants.....	43

IV

ILLUSTRATIONS.

	Page.
Royal New Zealand Society for the Health of Women and Children.....	46-52
Aims and objects.....	46
Membership.....	47
Local committees.....	47
Central organization.....	47
Training of nurses.....	48
Kinds of work.....	49
Extent of work.....	51
Conclusion.....	52
Appendixes.....	55
Appendix A.—Extracts from "Report on the Work of the Royal New Zealand Society for the Health of Women and Children"	57
B.—Regulations regarding storage and sale of milk.....	62

GENERAL TABLES.

Table 1. Births, infant deaths, and infant mortality rates, by cause of death, New Zealand, 1872-1919.....	67
2. Infants under 1 year of age in foster homes at beginning of year, and admissions and withdrawals during year, 1908-1918.....	70
3. Decline in death rate among children under 6 years of age in foster homes, 1908-1918.....	70
4. Infants under 1 year of age in exempted institutions at beginning of year, and admissions during year, 1908-1918.....	70
5. Decline in death rate among children in exempted institutions, 1909-1918.....	71
6. Medical practitioners on register, New Zealand, 1914-1919.....	71
7. Proportion of breadwinners in the population 10 years of age and over, by sex and age, New Zealand, 1916.....	71
8. Economic status of breadwinners, by occupation group and sex, New Zealand, 1916.....	72
9. Proportion of illegitimate births, New Zealand, 1877-1919.....	72

CHARTS.

Chart I. Infant mortality rates, New Zealand and United States birth-registration area as a whole, Minnesota, and Pennsylvania, 1919.....	2
II. Infant mortality rates, by cause of death, New Zealand and United States birth-registration area as a whole, Minnesota, and Pennsylvania, 1919.....	4
III. Infant mortality rates, New Zealand and American cities studied by the Children's Bureau.....	5
IV. Infant mortality rates from principal causes, New Zealand and American cities studied by the Children's Bureau.....	6

ILLUSTRATIONS.

The St. Helen's Hospital, Wellington, New Zealand.....	Facing page 36
View of the grounds, St. Helen's Hospital, Wellington, New Zealand.....	Facing page 37

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF LABOR,
CHILDREN'S BUREAU,
Washington, February 9, 1922.

SIR: There is transmitted herewith a report on Infant Mortality and Preventive Work in New Zealand, by Robert Morse Woodbury, Ph. D. As the infant mortality rate in New Zealand is lower than in any other country in the world and about half that in the United States birth-registration area, it is believed that this analysis of conditions in New Zealand will be read with interest by many Americans.

Material on which the report is based was secured by Dr. Woodbury during a recent visit to New Zealand.

Acknowledgment is made of the very generous assistance of the health department, the department of education, the census and statistics office, and other Government agencies of New Zealand, as well as of the Royal New Zealand Society for the Health of Women and Children in furnishing documents and information for use in preparing the report.

Respectfully submitted.

GRACE ABBOTT, *Chief.*

HON. JAMES J. DAVIS,
Secretary of Labor.

v

INFANT MORTALITY AND PREVENTIVE WORK IN NEW ZEALAND.¹

INFANT MORTALITY IN NEW ZEALAND AND ELSEWHERE.

In 1919 the infant mortality rate for the whole of New Zealand, exclusive of the native, or Maori, population,² was 45.3 per 1,000 live births. Comparison with similar rates for other countries for the latest available years up to 1919, as given in Table I, shows that New Zealand had a lower infant mortality rate than any other country in the world. The rate in the United States in 1919 was 86.6, or nearly twice as high.

New Zealand, therefore, possesses great interest for students of infant mortality. What are the causes of this exceptionally low infant mortality rate? Is it due primarily to health measures and infant-welfare work, or should it be ascribed mainly to especially favorable local conditions?

In the following pages an analysis of the statistics for New Zealand showing the decline in infant mortality from the various causes of death is presented. The local conditions affecting infant mortality are described—those which favor permanently low mortality and those which have become progressively more favorable to low rates. Next an account is given of various governmental and private health measures, in particular the special measures of the health and education departments and the work of the Royal New Zealand Society for the Health of Women and Children. In conclusion, the relation between these preventive measures and the decline in infant mortality is discussed.

¹ A paper summarizing the material presented in this bulletin was read at the annual meeting of the American Child Hygiene Association at St. Louis, October, 1920, and is printed in the Transactions of the Eleventh Annual Meeting of the American Child Hygiene Association, Oct. 11-13, 1920.

² Birth and death registration statistics for the Maori population are still in an unsatisfactory state. As Maori are counted those living as Maoris, i. e., in Maori villages; Maoris or half-castes who live as Europeans are included in the general statistics.

TABLE I.—*Infant mortality rates for certain foreign countries and the United States, 1919.*¹

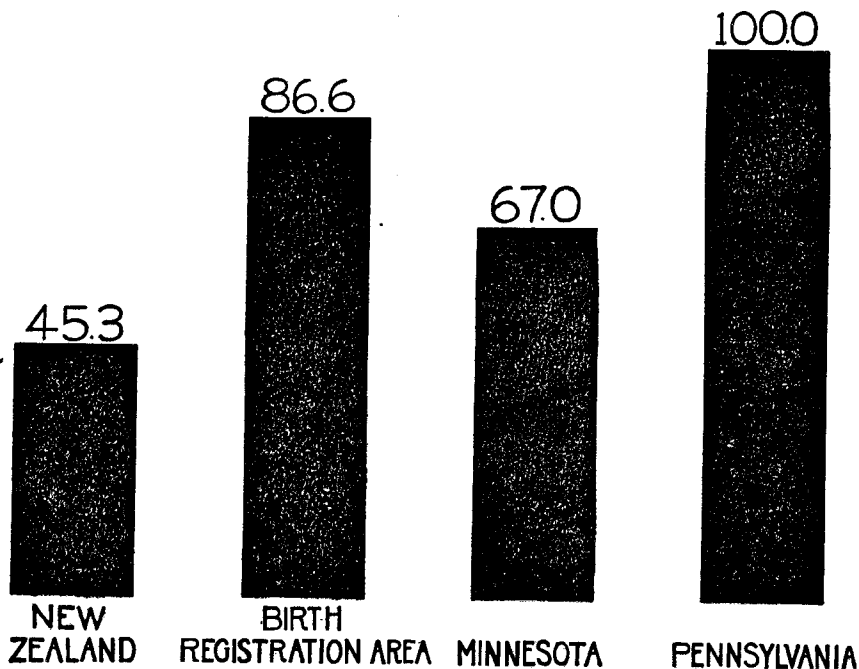
Country and year.	Infant mortality rate.	Country and year.	Infant mortality rate.
Chile (1919).....	306	Denmark (1919).....	92
Hungary (1915).....	264	England and Wales (1919).....	89
Japan (1918).....	189	Ireland (1919).....	88
Spain (1918).....	183	United States (birth-registration area) (1919).....	87
Germany (1919).....	145	Netherlands (1919).....	84
Quebec (1919).....	143	Switzerland (1919).....	82
Italy (1917).....	139	Sweden (1916).....	70
Finland (1919).....	135	Australia (1919).....	69
France (1919).....	119	Norway (1917).....	64
Scotland (1919).....	102	New Zealand (1919).....	45
Uruguay (1919).....	101		
Ontario (1919).....	96		

¹ Sources: Statistical yearbooks or other official publications of the different countries. Figures are given for 1919, or for latest available year.

Comparison with the United States.

In Table II comparative infant mortality rates are shown by causes of death for New Zealand and for the United States birth-registra-

CHART I. INFANT MORTALITY RATES, NEW ZEALAND AND UNITED STATES BIRTH-REGISTRATION AREA AS A WHOLE, MINNESOTA, AND PENNSYLVANIA, 1919.



tion area in 1919. The differences in rates from the different causes are striking. In the United States the rate from gastric and intes-

tinal diseases was five and one-half times as high as in New Zealand; while the rate from respiratory diseases was over three times, and that from epidemic diseases exactly six times as high as in New Zealand. New Zealand evidently had the greatest advantage in the rates from these three principal groups of causes. But even in the groups "early infancy" and "malformations," differences appear. In the United States the mortality rate from malformations was nearly one and one-half times that in New Zealand, while the rate from causes peculiar to early infancy was one-fifth higher than in New Zealand. The rate from ill-defined diseases in the United States was 2.7 deaths per 1,000 births, while in New Zealand but a single death was so classed.

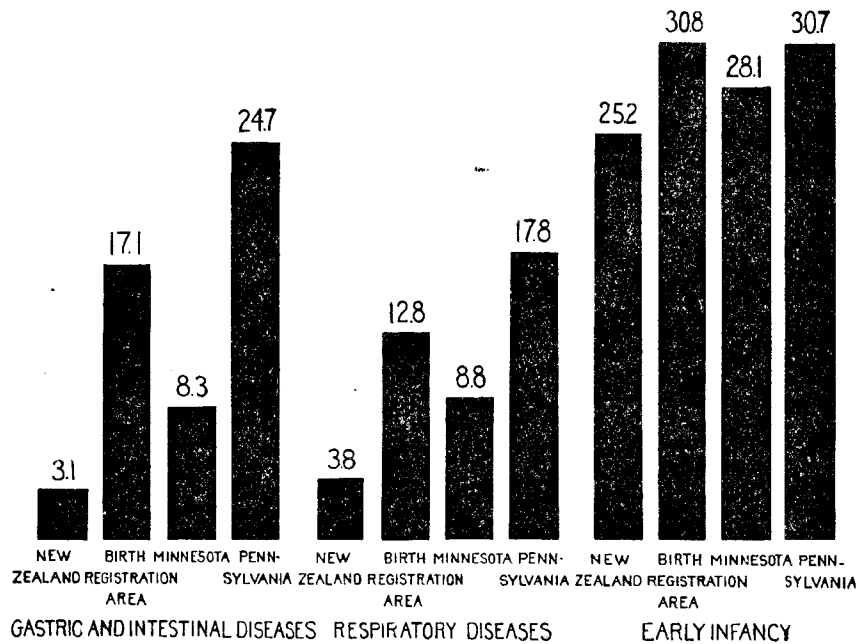
TABLE II.—Comparative infant mortality rates, by cause of death, New Zealand and the United States birth-registration area, Minnesota, and Pennsylvania, 1919.¹

Cause of death.	Infant mortality rates, 1919.			
	New Zealand.	U. S. birth-registration area.	Minnesota.	Pennsylvania.
All causes.....	45.3	86.6	67.0	100.0
Gastric and intestinal diseases.....	3.1	17.1	8.3	24.7
Respiratory diseases.....	3.8	12.8	8.8	17.8
Malformations.....	4.6	6.3	6.2	7.9
Early infancy.....	25.2	30.8	28.1	30.7
Epidemic diseases.....	1.6	9.6	7.5	9.7
Ill-defined.....	.....	2.7	1.5	1.0
All other.....	6.9	7.3	6.5	8.3

¹ First column compiled from Statistics of the Dominion of New Zealand, 1919, Vol. I, pp. 53-62; remainder of table compiled from U. S. Bureau of the Census, Birth Statistics, 1919, pp. 37, 288, and U. S. Bureau of the Census, Mortality Statistics, 1919, pp. 548, 552. Gastric and intestinal diseases include International List numbers 102-104; respiratory diseases, 89, 91, and 92; malformations, 150; early infancy, 151-153; epidemic diseases, 6-10, 14, 18, 24, 28-35, 37; ill-defined, 187-189; "all other" includes all not otherwise classified.

Even in States in the birth-registration area where comparatively favorable conditions prevail, infant mortality was considerably greater than in New Zealand. To illustrate this point figures are shown for Minnesota, the State which in 1919 had the lowest infant mortality rate for any State in the original birth-registration area established in 1915. To show the contrast within the area, figures are given also for Pennsylvania, which had the highest rate for any State in the original area. In Minnesota the mortality rate from gastric and intestinal diseases was nearly three times, while in Pennsylvania it was eight times, that in New Zealand. The mortality rate from respiratory diseases was over twice as high in Minnesota and nearly five times as high in Pennsylvania as in New Zealand. Similarly for the other causes of death, in nearly every case Minnesota had a lower

CHART II.—INFANT MORTALITY RATES, BY CAUSE OF DEATH, NEW ZEALAND AND UNITED STATES BIRTH-REGISTRATION AREA AS A WHOLE, MINNESOTA, AND PENNSYLVANIA, 1919.



rate than Pennsylvania, but the low rate in Minnesota was considerably higher than the rate in New Zealand.

Comparison with American cities studied by the Children's Bureau.

In Table III a comparison is presented of the infant mortality rates in New Zealand as a whole and in its four principal cities for the year 1919, and in eight American cities studied by the Children's Bureau for the years to which the studies referred. It will be noted that the mortality rates of the four principal cities of New Zealand were only slightly above that for the whole country, and that all these rates were below, and in many cases far below, those in the American cities selected for special study.

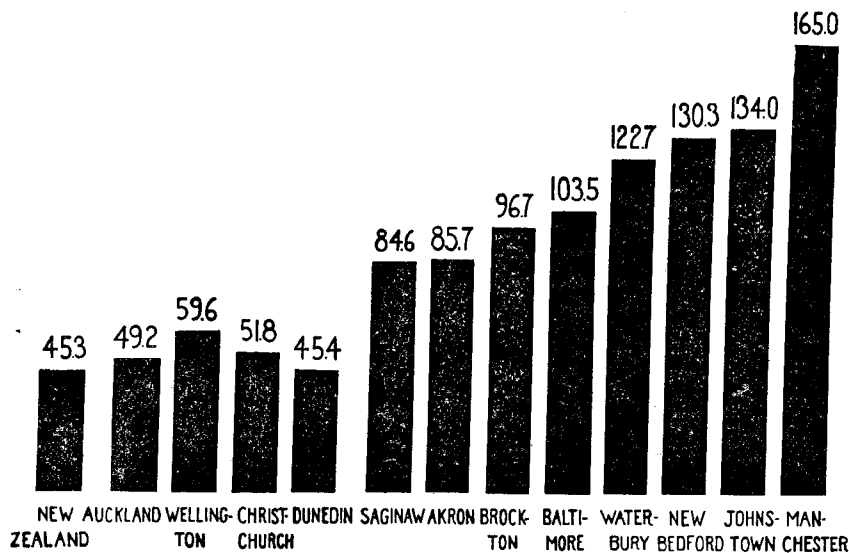
TABLE III.—Comparative infant mortality rates, New Zealand and eight American cities studied by the U. S. Children's Bureau.

Locality.	Infant mortality rate. ¹	Locality.	Infant mortality rate. ¹
New Zealand.....	45.3	Manchester.....	165.0
Auckland.....	49.2	New Bedford.....	130.3
Wellington.....	59.6	Brockton.....	96.7
Christchurch.....	51.8	Saginaw.....	84.6
Dunedin.....	45.4	Waterbury.....	122.7
8 American cities.....	111.2	Akron.....	85.7
Johnstown.....	134.0	Baltimore.....	103.5

¹The rates for New Zealand are for 1919; for the American cities studied by the bureau the rates are for births in a single year within the period Nov. 1, 1912-June 30, 1914, except Johnstown, 1911, and Baltimore, 1915.

In Table IV these rates are analyzed by cause of death. This comparison shows that over these American cities, as well as over the entire United States birth-registration area, New Zealand had the greatest advantage in the mortality from gastric and intestinal dis-

CHART III.—INFANT MORTALITY RATES, NEW ZEALAND AND AMERICAN CITIES STUDIED BY THE CHILDREN'S BUREAU.



eases. Its advantage was nearly as great in the case of respiratory diseases. In the rate from causes peculiar to early infancy, on the other hand, New Zealand's advantage was relatively slight.

From gastric and intestinal diseases the mortality in New Zealand in 1919 was 3.1 per 1,000 births, as contrasted with rates averaging 10 times as high in the eight American cities. In Manchester, where the rate was highest, it was 63.3; in New Bedford it was 48.3; while in the more favorably situated cities, Brockton and Saginaw, it was

12.4 and 8.2, respectively. New Zealand has evidently reduced its mortality from this group of causes almost to the minimum possible.

TABLE IV.—Comparative infant mortality rates, by cause of death, New Zealand and eight American cities studied by the U. S. Children's Bureau.

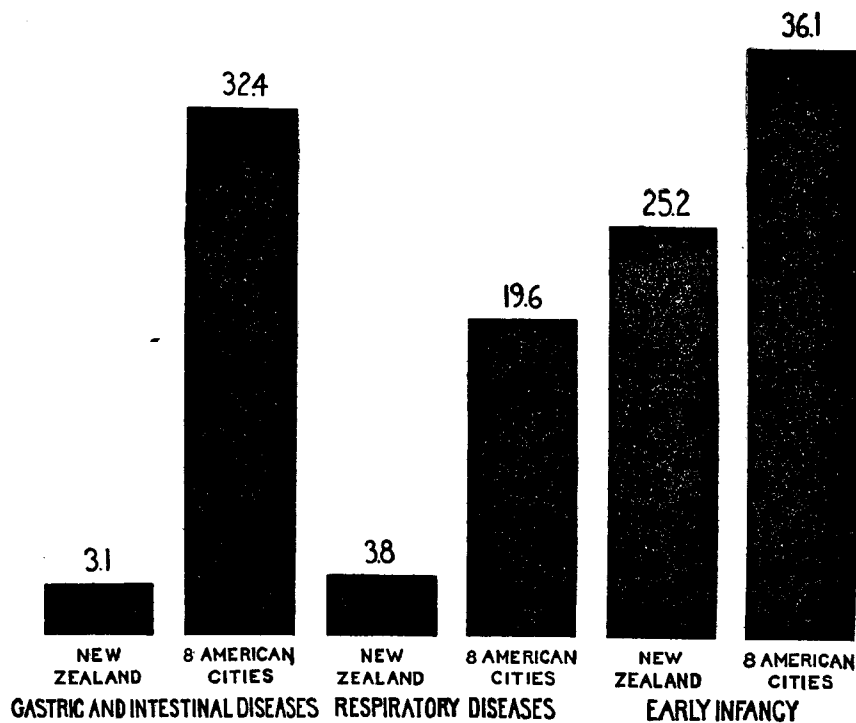
Cause of death.	Infant mortality rates.									
	New Zealand, 1919.	Eight American cities. ¹	Johnstown.	Manchester.	New Bedford.	Brockton.	Saginaw.	Waterbury.	Akron.	Baltimore.
All causes.....	45.3	111.2	134.0	165.0	130.3	96.7	84.6	122.7	85.7	103.5
Gastric and intestinal diseases ²	3.1	32.4	32.8	63.3	48.3	12.4	8.2	41.0	20.4	29.1
Respiratory diseases.....	3.8	19.6	26.7	26.2	27.8	13.2	10.2	18.2	10.2	19.7
Malformations.....	4.6	4.3	3.4	9.0	4.6	5.0	4.1	4.7	4.0	3.6
Early infancy.....	25.2	36.1	39.6	39.6	29.0	37.2	37.7	38.7	28.9	37.7
Epidemic diseases ³	1.6	7.1	11.6	3.2	8.9	8.3	5.1	8.4	5.8	6.7
Ill-defined.....	.....	2.5	7.5	7.0	2.7	5.0	4.1	1.9	4.4	6.6
All other.....	6.9	9.3	12.3	16.6	8.9	15.7	15.3	9.8	12.0	6.0

¹ Studied by the U. S. Children's Bureau; rates are for births in a single year about 1913, except Johnstown, 1911, and Baltimore, 1915.

² Includes only International List numbers 102-104.

³ Includes, besides diseases ordinarily classified as epidemic, tuberculosis and syphilis.

CHART IV.—INFANT MORTALITY RATES FROM PRINCIPAL CAUSES, NEW ZEALAND AND AMERICAN CITIES STUDIED BY THE CHILDREN'S BUREAU.



The infant mortality rate from respiratory diseases was likewise remarkably low in New Zealand, 3.8 in 1919 as compared with rates ranging from 10.2 in Saginaw and Akron to 27.8 in New Bedford in the years studied. The average for the eight American cities was 19.6, or approximately five times the rate for New Zealand.

In the third important group, causes peculiar to early infancy, the mortality rates were more nearly equal. In New Zealand the rate was 25.2. In Akron it was 28.9, and in New Bedford, 29; but in the other American cities studied it was notably higher—39.6 in Johnstown and Manchester, 38.7 in Waterbury, 37.7 in Saginaw and Baltimore, and 37.2 in Brockton. For all eight cities the average mortality from causes peculiar to early infancy was 36.1, nearly 11 points higher than in New Zealand.

The important, though subordinate, group of "epidemic diseases" showed a decidedly lower mortality in New Zealand than in most of the American cities studied. Thus in New Zealand the mortality rate from this group in 1919 was only 1.6, as compared with an average of 7.1 for the eight American cities. In Manchester, however, the mortality from epidemic disease was only 3.2; in Johnstown it was as high as 11.6.

Ill-defined causes were practically negligible in New Zealand; as already stated, in 1919 only one death was so classed. For the eight American cities, on the other hand, the average mortality from causes unknown or ill defined was 2.5 per 1,000 births. If these deaths had been properly assigned to definite causes, the mortality from the definite causes concerned would obviously have been somewhat higher than shown in the table. The comparisons given are, therefore, somewhat more favorable to the American cities than they would have been if the causes of death had been definitely diagnosed in as large a proportion of cases as in New Zealand.

The group of "all other causes," including, among others, meningitis, infantile convulsions, and infantile paralysis, showed a much lower mortality in New Zealand than in the American cities.

The only cause of death which showed a higher rate of mortality in New Zealand than in the eight American cities was "malformations"; and the difference was slight, the rates being 4.6 for New Zealand as compared with 4.3 for the American cities.

ANALYSIS OF STATISTICS OF INFANT MORTALITY, NEW ZEALAND.

Decline in infant mortality, 1872-1919.

In Table V is shown the decline in infant mortality in New Zealand from 1872 to 1919. In order to eliminate fluctuations, rates are given for five-year periods. In 1872-1874 the rate was slightly higher than the 1915 rate for the United States. It declined in a period of 45 years to less than one-half its former size.

In the first five-year period the mortality rate declined 4 per cent, and in the next 10 per cent; from this point to about 1899 the fall was relatively slight. After 1900 it became more rapid; the five-year period from 1900 to 1904 shows a decline of 7.7 per cent from the preceding period, while in the last five-year period under consideration the percentage of decrease nearly doubled that figure.

In interpreting this decrease it should be mentioned that, from the point of view of prevention, a fall of 10 points in the rate of mortality is more easily secured when the initial rate is 100 than when the initial rate is only 60. The increase in the rate of fall during the period 1910-1919 is, therefore, all the more noteworthy.

TABLE V.—*Decline in infant mortality rates, by periods; New Zealand, 1872-1919.*¹

Period.	Average annual infant mortality rate.	Amount of decrease.	Per cent decrease.	Period.	Average annual infant mortality rate.	Amount of decrease.	Per cent decrease.
1872-1874.....	105.9	.....	.....	1895-1899.....	82.7	2.9	3.4
1875-1879.....	101.5	4.4	4.2	1900-1904.....	76.3	6.4	7.7
1880-1884.....	91.4	10.1	10.0	1905-1909.....	69.6	6.7	8.8
1885-1889.....	86.3	5.1	5.6	1910-1914.....	57.0	12.6	18.1
1890-1894.....	85.6	.7	.8	1915-1919.....	48.6	8.4	14.7

¹ Compiled from General Table I, pp. 67-69.

Decline in infant mortality in cities.

Figures showing the decline in infant mortality rates for the four chief cities of New Zealand from 1904 to 1919 are given in Table VI. In all four cities substantial reductions in the mortality rates took place during this 15-year period. The reductions were greatest in Christchurch, a city of about 90,000 population in 1916, and in

Dunedin, with approximately 70,000, in both of which the 1919 rate was less than half that in 1904. Substantial reductions were also made in Auckland, with some 135,000 population, and in Wellington, a city of about 95,000.³

In both Auckland and Dunedin the rates of infant mortality in 1919 were less than 50 deaths under 1 year of age per 1,000 births. Dunedin had had a low rate for a number of years. Thus in 1909 its rate was 48.5; in 1911, 43.4; in 1912, 38.1; and for the three successive years 1917, 1918, and 1919 its rates were less than 50—40.2, 46, and 45.4, respectively. The rate for Christchurch during the same three years averaged only 51.3.

TABLE VI.—Decline in infant mortality rates, New Zealand cities, 1904–1919.¹

Year.	Infant mortality rates. ²				Year.	Infant mortality rates. ²			
	Auck-land.	Well-ington.	Christ-church.	Dune-din.		Auck-land.	Well-ington.	Christ-church.	Dune-din.
1904.....	70.1	95.3	103.0	93.0	1912.....	57.0	61.3	60.0	38.1
1905.....	91.5	96.2	89.0	67.1	1913.....	80.8	60.2	63.5	73.4
1906.....	85.8	71.9	74.4	72.6	1914.....	57.6	82.6	68.2	54.3
1907.....	97.2	117.8	126.2	95.4	1915.....	71.7	57.2	54.2	72.3
1908.....	81.9	81.7	67.8	74.5	1916.....	59.2	65.1	66.7	54.7
1909.....	61.9	84.2	62.8	48.5	1917.....	61.0	56.6	49.3	40.2
1910.....	79.0	84.6	69.4	79.1	1918.....	37.7	71.2	52.8	46.0
1911.....	63.0	73.4	62.9	43.4	1919.....	49.2	59.6	51.8	45.4

¹ Sources: New Zealand Official Year-Book, 1914, p. 169; 1919, p. 163; and Statistics of the Dominion of New Zealand, 1919, Vol. I., p. 85.

² Cities include suburban boroughs.

Decline in infant mortality, by cause of death.

Turning to the analysis of the fall in infant mortality by cause of death, Table VII shows infant mortality rates for the several groups of causes. In order to eliminate minor fluctuations, rates are given, as before, for five-year periods.

One of the most important causes of decline in the general death rates for all ages since the seventies of the last century has been the gradual control of epidemic and infectious diseases. The effect is shown in the group of diseases classed as epidemic, including scarlet fever, whooping cough, diphtheria, and measles. This group shows for infants in New Zealand a rapid fall from 14.7 in 1872–1874 to 8.8, 7.9, and 6.4, respectively, in the three following five-year periods. In 1890–1894 the rate from these diseases went up to 10.2, probably owing to an epidemic of influenza, but since then it has fallen to 5.2 in 1900–1904, and to 2.4 in 1910–1914. In 1915–1919 it was 2.5.

³ At the census of Oct. 15, 1916, Auckland had a population of 133,712; Wellington, 95,235; Christchurch, 92,733; and Dunedin, 68,716 within their respective "metropolitan areas." New Zealand Official Year-Book, 1919, p. 110.

TABLE VII.—Decrease in infant mortality rates, by cause of death, New Zealand, 1872-1919.¹

Period.	Deaths under 1 year per 1,000 births.											
	Epidemic diseases (1-19).	Tuberculosis (28-35).	Venereal diseases (37, 38).	Encephalitis meningitis, and infantile paralysis (60, 61, part 63).	Respiratory diseases (86-98).	Gastric and intestinal diseases (102-110).	Infantile convulsions (71).	Malformations (150).	Early infancy (151-153).	External (155-186).	Other defined (—).	Ill-defined (187-189).
1872-1874.....	14.7	4.7	0.2	1.7	12.5	23.2	10.0	0.6	23.6	1.4	10.5	2.3
1875-1879.....	8.2	5.7	.3	1.6	12.3	22.3	8.2	1.5	24.2	2.0	13.7	1.2
1880-1884.....	7.9	5.0	.3	1.3	12.2	18.0	7.9	1.4	23.1	1.9	12.0	.3
1885-1889.....	6.4	4.2	.4	1.3	10.8	20.0	6.7	1.2	25.7	1.3	7.4	.4
1890-1894.....	10.2	3.3	.5	1.3	11.3	17.0	6.4	1.2	25.0	1.3	7.7	.3
1895-1899.....	5.7	3.1	.6	1.2	10.4	18.5	6.4	1.6	26.1	2.0	7.0	.2
1900-1904.....	5.2	1.8	.5	1.2	10.0	16.0	4.5	1.6	27.0	2.2	6.1	.1
1905-1909.....	3.9	1.4	.5	1.3	8.4	15.5	3.6	1.4	26.6	2.0	4.5	.1
1910-1914.....	2.4	.9	.4	1.4	5.8	10.0	2.5	3.0	27.0	2.0	2.5	.1
1915-1919.....	2.5	.4	.4	1.1	4.5	5.3	2.1	4.1	25.2	.6	2.3	.1

¹ Compiled from General Table 1, pp. 67-69. The figures under the causes of death refer to the International List numbers included in each group.

Tuberculosis also showed a marked decline as a cause of infant mortality as early as the seventies and eighties. From 5.7 per 1,000 births in 1875-1879, the rate fell in 10 years to 4.2 and in the next 10 years to 3.1; in the period 1905-1909 it reached 1.4, and in the last 5-year period it was only 0.4. In other words, during this 40-year period, the mortality from tuberculosis was reduced from nearly 6 per 1,000 to four-tenths of 1 per 1,000 births.

The mortality from venereal disease—syphilis—meanwhile remained practically stationary, or even slightly increased. Doubtless the mortality from this cause was much understated, owing to unwillingness to certify to the facts in such cases.

The mortality from the group "encephalitis,⁴ meningitis, and infantile paralysis" also showed little change. A slight fall appeared from 1872-1874 to 1880-1884, but after that time there was little or no significant change.

The infant mortality rate from convulsions decreased from 10 in 1872-1874 to 2.1 in 1915-1919. This decrease was doubtless due in part to a gradual improvement in the assignment of deaths to the real causes instead of to the final symptoms, and in part to an actual decrease in the death rate from the real causes themselves.

The mortality rate from external causes remained practically constant from 1872-1874 to about 1905-1909. From 2 in the latter period, the rate diminished to 0.6 in 1915-1919. The spread of prohibition in local areas and the increasing control over the liquor

⁴ In the earlier years the term "encephalitis" was frequently returned in death certificates, probably meaning either meningitis or poliomyelitis.

traffic may have had an influence in diminishing infant mortality from these causes.

"Other defined causes" showed a fairly steady decline from a rate of 12 in 1880-1884 to one of 2.3 in 1915-1919.

The rate for causes ill-defined or unknown diminished from 2.3 per 1,000 births in 1872-1874 to 1.2 in 1875-1879, and to an insignificant figure in the following periods, as the certification of causes of death became more accurate.

Coming now to the more important groups of causes of death among infants, the gastric and intestinal diseases, the respiratory diseases, and the causes peculiar to early infancy will be taken up in order. The group of gastric and intestinal diseases⁵ is by far the most deadly to infant life, with the single exception of the causes peculiar to early infancy. The decline in mortality from diarrhea and enteritis is, therefore, worthy of especial attention. In the period 1872-1874, the rate of mortality from these diseases was 23.2 per 1,000 births. With some fluctuations the rate fell gradually to 15.5 in the period 1905-1909, a decline of 7.7 points in 35 years, or an average of 1 point every 5 years. From this period the fall was rapid. In the next 5 years the mortality decreased by 5.5 points, and in the last 5 years by 4.7 points more, approximately 1 point every year. In 1915-1919 the rate was only 5.3, and in 1918-19, the last years in the group, it averaged only 3.6 per 1,000 live births.⁶ Between the period 1905-1909 and the years 1918-19 the mortality from gastric and intestinal diseases was reduced by over three-fourths.

The mortality from respiratory diseases in 1872-1874 was 12.5 per 1,000 births. For 10 years it maintained approximately this rate; then it decreased gradually in the next 20 years to 10 in 1900-1904. From this point the decrease became more rapid. In 1905-1909 the rate was 8.4; in 1910-1914, 5.8; and in 1915-1919, only 4.5. During the last 15 years the rate was cut in two. The average annual decrease in the rate during these last 15 years was over three times the average annual decrease during the preceding 20 years.

The mortality from the third group of causes, those peculiar to early infancy, showed no such tendency to rapid fall. It rose from 23.6 in 1872-1874 to 27 in 1900-1904, an increase which may perhaps

⁵ In this discussion the group of gastric and intestinal diseases includes International List numbers 102-110.

⁶ It should be mentioned in passing that the dates for changes as given do not pretend to be exact. In order to show more clearly the trend of the rates, averages for five-year periods have been taken, and it is therefore difficult to state, for example, if the average for 1905-1909 is lower than that for 1900-1904, the exact year in which the decrease first took place. This is further complicated by fluctuations in temperature and weather conditions. Even with no causes tending toward a reduction in infant mortality, the rates vary from year to year with variations in temperature; hence, if it is sought to find the exact point at which a decrease commenced, it is necessary to take account of these variations during the period within which the decrease first appeared.

be explained by improvement during this period in the registration of deaths at very early ages. At this point a change in the trend appeared and the rate fell slightly during the next five-year period, reaching 26.6; it rose during the next period to the same rate, 27, as in 1900-1904, and fell again in 1915-1919 to 25.2. The further course of the rates will show whether this decline which appeared in the last period can be considered as marking the beginning of a consistent downward movement.

The rate from malformation showed little change between the period from 1875 to 1879 and that from 1905 to 1909, averaging about 1.4. It rose in 1910-1914 to 3 and in 1915-1919 to 4.1. Reference to the rates for the individual years in General Table 1, p. 68, indicates that a marked increase in the rate first appeared in 1912 and that after that date the rate was maintained at a higher level than previously. Since the law requiring stillbirths to be registered was passed in the year 1912,⁷ it seems probable that the increase in the rate from malformations was due to a more accurate distinction between births and stillbirths, resulting since 1913 in the registration of the live births and deaths of a small number of infants who formerly would not have been registered.

In the analysis of the fall in the infant mortality rates in New Zealand two periods may be distinguished. The first is from 1872 to about 1905; during this period the fall in the mortality from epidemic diseases, convulsions, tuberculosis, and ill-defined causes was continuous and rapid, and the fall in the mortality from gastric and intestinal and from respiratory diseases was slight. The second period is from about 1905 to 1919; during this time the fall in the mortality from gastric and intestinal diseases proceeded at a rate five times as great, and that from respiratory diseases at a rate over three times as great as during the preceding period. During these last 15 years the mortality from gastric and intestinal diseases was reduced to one-fourth its former rates, and that from respiratory diseases was cut in half.

⁷ New Zealand Official Year-Book, 1919, p. 115.

BIRTH AND DEATH REGISTRATION.

Since the accuracy of these statistics obviously depends upon the completeness of birth and death registration, the principal requirements of the compulsory registration laws will be briefly stated and evidence will be presented relating to completeness of registration.

Notification and registration of births.

The law of New Zealand requires both the notification and the registration of the birth of every infant, whether live or stillborn.

Notification must be given within 48 hours after the birth has occurred if in a borough, or within 21 days if in any other locality, and is the duty of the "occupier" of the house in which the birth takes place, who is required to report the fact, the date of occurrence, and the name and address of the mother or father to the local registrar of births and deaths.⁸ This notice must also be signed by "some person, if any (other than the occupier), in attendance at the confinement."

Sixty-two days are allowed for the registration of births. It is the duty of the father or mother of the child to register; but, in case of the death, absence, or inability of both parents, the occupier of the house in which the child is born, and all persons present at the birth, are required to give the particulars necessary for registration. Births which have not been registered within the 62-day period may be registered within 6 months after the date of birth upon a statutory declaration of the facts made before the registrar by the parent or some person present at the birth; but for this late registration a fee of 5 shillings may be imposed. After 6 months, births can not be registered except after conviction for neglect of one of the persons responsible.⁹

In practice, on receiving notification of a birth, the registrar sends to the father or mother, at the address given, a notice to appear at the local registry office before the end of the two months to give the information required for registration. If this notice is not heeded,

⁸ For the purposes of the act, the "master, keeper, chief officer, or other person in actual charge of any prison, hospital, lunatic asylum, or public or charitable institution shall be deemed to be the occupier thereof." Section 38, Consolidated Statutes, births and deaths registration act, 1908, No. 16.

⁹ Consolidated Statutes, births and deaths registration act, 1908, No. 16, amended by Statutes, 1912, No. 18, and 1915, No. 56. See also discussion of special registration law, p. 15.

a second one is sent, to the effect that the birth must be registered before the expiration of the six-months' period. If no attention has been paid to either of these notices the information is turned over to the department of justice, and the persons responsible for the neglect are prosecuted.

Compulsory registration of live births has been in force since 1855. The registration of stillbirths¹⁰ has been required only since March 1, 1913. Both these statements apply only to white births. Separate regulations apply to births of Maoris.

Registration of deaths.

A death must be registered within three days if it occurs in a borough, or within seven days if in any other locality. The duty of registration lies with the undertaker in charge of the funeral. The law provides also that burial of the body shall not take place until a certificate of the cause of death signed by a registered medical practitioner, a coroner's order, or a registrar's certificate of registration has been obtained. Undertakers are required to notify the registrar of all burials performed by them. The police are required to investigate any deaths that occur, and give notice thereof to the registrar, whereupon he may order the persons responsible for giving information to appear before him. Physicians in attendance are required to certify to the cause of death.¹¹

The body of a stillborn child may not be buried without a certificate that the child was stillborn, signed by a registered medical practitioner who was in attendance at the birth or who has examined the body, or, if no physician was present or if a certificate can not be obtained, without a statutory declaration by the person responsible for registering the birth to the effect that the child was stillborn.¹²

Completeness of birth and death registration.

Registration of deaths is in general comparatively easy to enforce, since a death must be registered before burial is permitted. Omissions, if any, would be much more likely to occur in the country districts—the "back blocks," as they are called in New Zealand—than in the cities. In the country the difficulties of notifying the registrar or of finding an undertaker are often great, and it is easy to bury privately without danger of detection. In the cities, however, it is difficult to avoid the provisions of the law. But the infant mortality rate in the four cities, where registration of deaths on this hypothesis would be most complete, is nearly as low as in the entire Dominion. One may fairly conclude, therefore, that the low infant

¹⁰ A stillbirth is defined as a dead-born issue of at least 28 weeks uterogestation. Statutes 1915, No. 56, sec. 4 (births and deaths registration amendment act, 1915).

¹¹ Consolidated Statutes, births and deaths registration act, 1908, No. 16, secs. 24ff.

¹² Consolidated Statutes, births and deaths registration act, 1908, No. 16, sec. 36, Statutes, 1912, No. 18, sec. 4.

mortality rate in New Zealand is not due to incomplete registration of deaths, but reflects especially favorable conditions.

If registration of deaths is nearly complete, the very fact that the infant mortality rates are low is strong evidence that registration of births is also nearly complete. So far as could be learned no special canvasses or tests for unregistered births are made. It has been the custom, however, to pass from time to time special laws permitting late registration of births which, without such special laws, could be registered only after prosecution and conviction for failure to register. The last such special registration law was passed in 1915. By it the registrar general was authorized to register, on payment of a fee of 5 shillings, any births not previously registered. Such births, however, had to be registered within one year. About 500 births were added to the register under this special law. Since nearly 27,000 births occur every year, and about five years had elapsed since the last special registration law, the proportion of births which had not been registered was apparently very low.¹³

Furthermore, the people of New Zealand are familiar with the requirements of the law and with the use of birth certificates as evidence of age. Birth certificates are used in connection with the enforcement of the school-attendance law and in connection with granting permits for children to be employed in factories and workshops. Toward the end of the war legislation providing for military registration and conscription added other uses for birth certificates. The long period during which birth registration has been compulsory would justify an inference that the population is familiar with the requirements of the law, and the various ways in which birth certificates are used would tend to make parents regard registration of the births of their children as an important duty. Under these conditions, it might fairly be expected that the vast majority of births would be registered promptly and that a special registration law, allowing late registration without the usual penalties, would bring in a large proportion of the delinquents whose children were still alive.

Birth and death registration, then, is fairly complete at the present time. The question remains whether the decrease in the infant mortality rate since 1875 is due wholly or in part to improved registration of births. It has already been noted that compulsory birth registration went into effect in 1855, or nearly 20 years before the period to which any of the figures here used relate. The statistics of birth rates may be used to test improvements in registration.

¹³ For a discussion of the number of unregistered births in connection with the results of the last census, see Report on the Results of a Census of the Population of the Dominion of New Zealand, taken for the night of the 15th October, 1916, p. 13: "Probably unregistered births do not exceed 100 annually."

Since these rates are computed from the births that are registered, a marked improvement in registration would appear in an apparent increase in the birth rate. But, as shown in Table VIII, the ratio of registered births to population reached its maximum in the period 1876-1880.

A further reason for concluding that the fall in mortality rates is due to an actual decrease in the proportion of deaths rather than to an improvement in birth registration is that this fall has not been uniform for the different causes of death. A change in the completeness of registration of births would affect all causes uniformly. The figures show, however, that from 1875 to 1905 a rapid decline appeared in epidemic diseases, convulsions, and tuberculosis, other groups showing smaller rates of decrease or remaining nearly stationary, while from 1905 to 1919 the decline in gastric and intestinal diseases and in respiratory diseases was marked. One may conclude, therefore, that the decline in infant mortality rates shown by the figures represents a real achievement in prevention of infant mortality.

TABLE VIII.—*Birth rates, by periods, New Zealand, 1871-1919.*¹

Period.	Annual births per 1,000 population.	Period.	Annual births per 1,000 population.	Period.	Annual births per 1,000 population.
1871-1875.....	39.88	1896-1900.....	25.75	1917.....	25.69
1876-1880.....	41.21	1901-1905.....	26.60	1918.....	23.44
1881-1885.....	36.36	1906-1910.....	27.06	1919.....	21.54
1886-1890.....	31.15	1911-1915.....	25.98		
1891-1895.....	27.68	1916.....	25.94		

¹ New Zealand Official Year-Book, 1919, p. 117. Figures for 1919 from Statistics of the Dominion of New Zealand, Vol. I, p. 33.

RELATION BETWEEN GENERAL CONDITIONS AND INFANT MORTALITY.

In the following section the general conditions in New Zealand which might have had an influence on infant mortality are discussed. Among these conditions are: Climate, racial composition, literacy, density, proportion of population living in towns, housing and overcrowding, the birth rate, illegitimacy, and economic conditions. In analyzing the connection between these conditions and the infant mortality rate, the distinction should be kept constantly in mind between a factor such as climate, which is favorable to low mortality throughout the period, and a factor such as the increasing proportion of the population living in cities, the influence of which upon infant mortality is subject to a progressive change. These conditions, moreover, are to be distinguished from the activities of the different governmental and private agencies directed toward prevention of infant mortality, most of which, such as the Royal New Zealand Society for the Health of Women and Children, influenced only the latter part of the 50-year period. These activities are discussed later.

Climate.

The influence of hot temperatures in causing heavy mortality from gastric and intestinal diseases is well known and is illustrated by the "summer peaks" of infant deaths from these diseases in the United States death-registration area.¹⁴ To a less marked degree the deaths from respiratory diseases are piled up into a "winter peak."¹⁵ Climate, therefore, has an important influence in determining the infant mortality rate.

New Zealand has a climate exceptionally favorable for infant life. Though the three islands which compose the Dominion measure approximately a thousand miles from the north to the farthest south, the climate throughout is tempered by sea breezes, and the summers are cool and the winters mild. Perhaps the climate of northern California is more similar to that of New Zealand than is that of any other part of the American Continent. Though the latitude of Auckland (36° 50' S.) corresponds to a latitude south of Washington, D. C., the highest temperature on record was only 91°

¹⁴ See *Save the Youngest* (revised), pp. 10, 11, U. S. Children's Bureau publication No. 61, 1921.

¹⁵ In the United States birth-registration area in 1919, out of 17,637 deaths under 1 year from respiratory diseases, 8,427, or 47.8 per cent, occurred in the three winter months of January, February, and March. Nearly one-fifth of all these deaths occurred in March alone. Compiled from U. S. Bureau of the Census, *Birth Statistics, 1919*, p. 302.

F.; and though the latitude of Dunedin ($45^{\circ} 52' S.$) corresponds to that of Minneapolis, the coldest temperature ever officially recorded at Dunedin was 23° , or only 9° below the freezing point.

In Table IX average summer and winter temperatures for the period from 1914 to 1918 for the four chief cities of New Zealand are shown, together with comparative data for seven American cities. The most striking difference is the absence of extremes of temperature in the New Zealand cities. In this respect the climate of San Francisco or that of Seattle appears to be most similar to that of the New Zealand cities; and in this connection it may be noted that in 1919 Seattle had the lowest infant mortality rate for any city of its size in the United States birth-registration area, and that the rate of San Francisco was also relatively low.

Table X, which gives the mean monthly temperatures for the summer months for the four cities in each year from 1914 to 1918, inclusive, shows that in 1918 the average daily temperatures during the hottest summer month, February—corresponding to August in the Northern Hemisphere—were for Auckland 68° , for Wellington 65.6° , for Christchurch 63° , and for Dunedin 61.3° . The maximum temperatures in the same year were, respectively, for Auckland 78° , for Wellington 79.3° , for Christchurch 83.9° , and for Dunedin 81° .

The average daily temperatures in 1918 during the coldest winter month, July—corresponding to January in the Northern Hemisphere—were for Auckland 49.4° , for Wellington 45.5° , for Christchurch 39.6° , and for Dunedin 40.3° . The minimum temperatures were for Auckland 35° , for Wellington 30.1° , for Christchurch 27.2° , and for Dunedin 28° .

TABLE IX.—Mean summer and winter and maximum and minimum temperatures; comparative data for four New Zealand and seven American cities, 1914-1918.¹

City.	Mean temperature.		Maximum temperature in 5-year period.	Minimum temperature in 5-year period.
	Three summer months.	Three winter months.		
New Zealand cities:				
Auckland.....	66.1	52.8	81.5	35.0
Wellington.....	63.3	49.4	85.0	30.1
Christchurch.....	60.8	44.1	91.5	22.6
Dunedin.....	58.4	44.8	86.0	28.0
American cities:				
Boston, Mass.....	68.9	29.1	98	-14
New York, N. Y.....	71.0	30.9	102	-13
Washington, D. C.....	74.5	34.6	106	-3
Chicago, Ill.....	70.6	25.9	102	-14
St. Louis, Mo.....	77.5	32.7	105	-17
Seattle, Wash.....	62.2	40.7	89	14
San Francisco, Calif.....	58.9	51.4	88	34

¹ Figures for New Zealand compiled from the New Zealand Official Year-Book, 1914-1919; figures for American cities compiled from manuscript figures furnished by the Weather Bureau. Figures are degrees Fahrenheit.

The climate of New Zealand obviously must be regarded as exceptionally favorable to a low infant death rate. The cool summers make the danger from gastric and intestinal diseases much less, and tend to increase the efficiency of preventive measures relating to the milk supply. The problem of the milk supply, even of the larger cities, is relatively simple in a country favored by such climatic conditions. Similarly, the mild winters tend to lessen the danger from respiratory diseases. In mild weather mothers are less likely to think it necessary to keep their babies in tightly closed or overheated rooms; on the contrary, out-of-door life is more natural.

Since there is no evidence that the climate of New Zealand is undergoing any progressive change, the factor of climate must be regarded as favorable to a low infant mortality rate throughout the entire 50-year period.

Racial composition of population.

An important factor in infant mortality is the racial composition of the population. Studies of infant mortality in the United States, for example, have shown widely varying rates for infants of white and colored mothers, and considerable variations in the death rates among infants of mothers of different nationalities.

In New Zealand the statistics do not include the Maori population, as registration of births and deaths among the Maoris is as yet incomplete. The Maori population comprises about 4.3 per cent of the total population of the Dominion.¹⁶

Of the inhabitants of New Zealand in 1916, exclusive of Maoris, an overwhelming majority, 98 per cent, were born in the United Kingdom or in British possessions and were therefore presumably of English, Scotch, Welsh, or Irish stock. Nearly three-fourths, 72.3 per cent, were born in New Zealand, 12.8 per cent in England, 4.7 per cent in Scotland, 4.2 per cent in Australia, and 3.4 per cent in Ireland.

Of the 1.7 per cent of the inhabitants born in foreign countries, 0.3 per cent were born in the German Empire, 0.2 per cent in Austria-Hungary, 0.2 per cent in Denmark, and 0.2 per cent in China. The total number of Chinese in 1916 was 2,147.

No significant change in the proportion of the population born in British possessions has taken place in the last 50 years.

A consequence of the high proportion of the population born in British possessions is that practically the entire population is English speaking. This is in marked contrast to the situation in the United States, where, in 1910, over 3,000,000 persons 10 years of age and over, forming 4.3 per cent of the total population and 22.8

¹⁶ In the census of 1916, 49,776 Maoris and 1,099,449 whites were enumerated.

per cent of the foreign white population of this age group, were unable to speak English.

Literacy.

A connection between literacy of the mother and infant mortality is suggested by the fact that the mother who can not read and write is limited to instruction and tradition transmitted by word of mouth, while the mother who is literate can derive information from the printed page. Studies made by the Children's Bureau in American cities have shown that the mortality rate among infants of illiterate mothers is higher than that among infants of mothers who are literate.¹⁷

Statistics of literacy show that New Zealand ranks very high in the proportion of its people who can both read and write. Of the population 10 years of age and over in 1916, only 1 per cent were unable to read and only 1.5 per cent were unable to write. In the United States, on the other hand, 7.7 per cent of the population of the same age group in 1910 were unable to write. This high proportion of illiterates in the United States is due chiefly to high percentages of illiteracy among the negroes and among the foreign born; but even among the native white of native parentage the proportion was 3.7 per cent, or considerably higher than that in New Zealand.¹⁸

Since 1875 the different censuses in New Zealand have shown a gradual decrease in the proportion of its inhabitants who were not able to read, from 3.1 per cent of the population 10 years of age and over in 1874¹⁹ to 1 per cent in 1916.²⁰

Density and distribution of population in city and country.

The density of population or the proportion of the inhabitants living in densely populated areas appears to have an important influence upon infant mortality. In practically every country infant mortality rates are lower in rural than in urban districts. In the United States birth-registration area in 1919 the States with the lowest infant mortality rates—Washington, Oregon, Minnesota, Kansas, California, and Utah—were those less densely populated and with large proportions of the population living in rural areas.²¹

¹⁷ See for example, *Infant Mortality: Results of a field study in New Bedford, Mass., based on births in one year*, p. 20, by Jessamine S. Whitney. U. S. Children's Bureau publication No. 68.

¹⁸ Thirteenth Census of the United States, Vol. I, Population, 1910, pp. 1185, 1187.

¹⁹ Compiled from Results of a Census of the Colony of New Zealand, taken for the night of the 1st of March, 1874, pp. 186-188.

²⁰ Compiled from Report on the Results of a Census of the Population of the Dominion of New Zealand, taken for the night of the 15th October, 1916, p. 66. The figures are not exactly comparable since the figures for 1874 exclude Chinese and relate to inability to read English, while those for 1916 include Chinese and relate to inability to read in any language.

²¹ U. S. Bureau of the Census, *Birth Statistics, 1919*, p. 37. Washington, 1921

The average density of population in New Zealand in 1916 was 10.6 persons per square mile, or one-third that of the United States in 1910, which was 30.9 persons per square mile.²² As compared with the States just mentioned, New Zealand's density of population exceeded that of Utah (4.5) and Oregon (7), but was only two-thirds that of California (15.3), less than two-thirds that of Washington (17.1) or of Kansas (20.7), and less than half that of Minnesota (25.7).

So far, then, as density of population alone is a factor in high or low infant mortality rates, conditions in New Zealand tend to favor a low rate.

On the other hand, the density of population increased rapidly in the last 50 years, rising from 2.5 to 10.6 persons per square mile between 1871 and 1916. Yet during this period the infant mortality rate, in spite of the increase in density, fell to less than half.

The number of persons per square mile varies so widely, from the sparsely settled rural or grazing areas to the well-populated cities, that the proportion of the population living in cities is probably a better measure of concentration in connection with infant mortality than average density. New Zealand had a slightly larger proportion of urban population than the United States. In 1916, 53 per cent of the population of the Dominion lived in cities and suburban areas of 2,500 or more population,²³ whereas only 46.3 per cent of the population of the United States in 1910 lived in urban areas. In New Zealand, however, the largest city, Auckland, had less than 135,000 population, while in the United States 34 cities larger than Auckland contained 20 per cent of the population.

During the period from 1881 to 1916 the proportion of the population of New Zealand living in "boroughs"—including many of the small cities and towns as well as all the large cities—increased from 40 to 53 per cent.²⁴ Evidently, therefore, the change in the proportion of urban population can not explain any part of the decrease in the infant mortality rate.

Housing congestion.

Of greater significance than density of population, in its influence upon infant mortality, is the character of housing conditions and in particular the degree of housing congestion.

In general, housing conditions in New Zealand, so far as they relate to lot occupancy and style of house, are excellent. The prevailing type of house is the one-story cottage or bungalow, and even in the largest cities the house is generally surrounded by a small plat

²² New Zealand Official Year-Book, 1919, p. 104; Thirteenth Census of the United States, 1910, Vol. I, Population, p. 42.

²³ Compiled from New Zealand Official Year-Book, 1919, pp. 108-111.

²⁴ New Zealand Official Year-Book, 1919, pp. 104-108.

of land used as a flower garden or for vegetables. Nowhere is there any extensive overcrowding in tenement houses. The built-up areas devoted to business are relatively small, manufacturing establishments are few, and transportation facilities permit those who prefer to live in the suburbs to travel back and forth to their work in the city center.

Tables X and XI throw light upon the degree of overcrowding in dwellings as expressed in terms of the average number of persons per room. In 1916, 57.6 per cent of all the inhabited private dwellings and tenements in the Dominion of New Zealand had an average of less than one person per room. Only 4 per cent had an average of two or more persons per room. According to Chapin's standard,²⁵ by which houses with over one and one-half persons per room are considered overcrowded, only 7.8 per cent of the houses in New Zealand would have been classified as congested.

Room congestion was slightly greater in rural than in urban areas, as shown in Table XI. In all New Zealand outside the four "metropolitan areas," which include the chief cities and their immediate suburbs, 12.8 per cent of the inhabited private dwellings and tenements had an average of one and one-half or more persons per room, as compared with only 7.9 per cent in the metropolitan areas. Among the four cities, Christchurch appeared to have had the least room congestion, and Wellington the most.

Comparative data in regard to housing congestion are not available for the United States. Data are also lacking for comparisons with previously existing conditions in New Zealand.

TABLE X.—Average number of persons per room in inhabited private dwellings and tenements, urban and rural areas, New Zealand, 1916.^a

Average number of persons per room.	Inhabited private dwellings and tenements.							
	New Zealand.	Rural areas.	Small cities.	Metropolitan areas.				
				Total.	Auckland.	Wellington.	Christchurch.	Dunedin.
Total.....	238,066	129,937	25,067	83,062	28,261	19,647	20,225	14,929
Less than one per room.....	137,139	69,177	15,610	52,352	18,266	11,667	12,968	9,451
One per room.....	41,806	24,605	4,026	13,175	4,323	3,374	3,170	2,308
Over one but less than one and one-half per room.....	31,498	17,533	3,313	10,652	3,541	2,656	2,539	1,916
One and one-half per room.....	7,775	4,803	676	2,296	736	600	539	421
Over one and one-half but less than two per room.....	9,039	5,594	820	2,625	840	668	616	501
Two or more per room.....	9,539	7,298	588	1,653	492	548	291	322
Not reported.....	1,270	927	34	309	63	134	102	10

^a Compiled from Results of a Census of the Dominion of New Zealand, 15th October, 1916, Part XI, Dwellings, pp. 7-11.

²⁵ Chapin, Robert Coit: The Standard of Living Among Workingmen's Families in New York City, p. 80. Russell Sage Foundation.

TABLE XI.—Comparative overcrowding of housing accommodations in urban and rural areas, New Zealand, 1916.¹

Average number of persons per room.	Cumulative per cent of dwellings with or exceeding specified average number of persons per room.							
	New Zealand.	Rural areas.	Small cities.	Metropolitan areas.				
				Total.	Auckland.	Wellington.	Christchurch.	Dunedin.
Two or more.....	4.0	5.6	2.3	2.0	1.7	2.8	1.4	2.2
Over one and one-half or more.....	7.8	9.9	5.6	5.2	4.7	6.2	4.5	5.5
One and one-half or more.....	11.1	13.6	8.3	7.9	7.3	9.2	7.1	8.3
More than one.....	24.3	27.1	21.5	20.7	19.8	22.8	19.7	21.2
One or more.....	41.9	46.0	37.6	36.6	35.1	39.9	35.4	36.6
Less than one.....	57.6	53.2	62.3	63.0	64.6	59.4	64.1	63.3
Not reported.....	.5	.7	.1	.4	.2	.7	.5	.1

¹ Derived from Table X.**Birth rate.**

The birth rate in New Zealand in 1919 was slightly lower than that of the United States birth-registration area—21.5 as compared with 22.3 births per 1,000 population. In 1915, however, the rate in New Zealand was above that for the United States, 25.3 as compared with 24.9. Comparisons with European countries as shown in Table XII, based on figures for 1914—a year in which the birth rate was not influenced by war conditions—reveal that eight European countries had lower birth rates than New Zealand. New Zealand's rate (26) was higher than the rates for France (18), Switzerland (22.5), Belgium (22.6, in 1912), Ireland (22.6), Sweden (22.9), England and Wales (23.8), Norway (25.2), and Denmark (25.6).

Following the period 1876–1880 the birth rate in New Zealand fell from an average of slightly over 41 to 25.1 in 1899 and 21.5 in 1919.²⁶ The rate in 1919 was doubtless somewhat affected by war conditions.

TABLE XII.—Birth rates in principal countries, 1914.¹

Country.	Births per 1,000 population.	Country.	Births per 1,000 population.	Country.	Births per 1,000 population.
France.....	18.0	Norway.....	25.2	Italy.....	31.0
Switzerland.....	22.5	Denmark.....	25.6	Japan.....	33.8
Belgium (1912).....	22.6	New Zealand.....	26.0	Quebec.....	36.0
Ireland.....	22.6	Scotland.....	26.1	Hungary (1912).....	36.3
Sweden.....	22.9	Finland.....	26.8	Chile.....	37.5
England and Wales.....	23.8	German Empire.....	26.8	Jamaica.....	38.9
Ontario.....	24.0	Australia.....	28.0	Ceylon.....	40.8
United States birth-registration area (1915).....	24.9	The Netherlands.....	28.2	Rumania.....	42.1
		Austria (1913).....	29.6		
		Spain.....	29.8		

¹ Sources: Statistical yearbooks or other official publications of the different countries.

In the four chief cities the birth rates were all less than in the entire Dominion, ranging in 1919 from 21.1 in Wellington to 17.9 in Dun-

²⁶ New Zealand Official Year-Book, 1919, pp. 116–117; 1920, p. 21.

din.²⁷ It is noteworthy that the cities stood in the same order in the size of the infant mortality rate as they did in the size of the birth rate, but that in all cities the infant mortality rate was higher than in the Dominion.

That the correspondence between low birth rates and low infant death rates is by no means a close one is shown by the many differences in position of the various countries in Tables I and XII, the former giving the rank of the countries in infant mortality rates and the latter their rank in birth rates.

Proportion of illegitimate births.

Since in all countries where they are available, statistics upon this subject show that the mortality of illegitimate infants is much higher than that of legitimate infants, the proportion of illegitimate births has an important bearing upon the general infant mortality rate.

As compared with those of other countries except the United States, the percentages of illegitimate births in New Zealand are low.²⁸

During the period under consideration this low proportion of illegitimate births was undoubtedly a factor in low infant mortality; but since it did not decrease during the period it can have had no influence on the decrease in infant mortality.

Economic level of the population.

Factors related to the economic well-being of the population—family income, wages, standard of life, employment of mothers, etc.—appear to have an important influence upon infant mortality. For the cities studied by the Children's Bureau, it has been shown that the higher the earnings of the fathers the lower the mortality among the infants. The employment of the mothers, which is more prevalent in the low-income groups, appears also to influence the infant mortality rate.²⁹ In this connection reference may be made to the striking contrasts in infant mortality rates in poor and in well-to-do sections of large cities.

Definite information on the economic conditions most directly related to infant mortality, such as the economic status of families in which births occur and the proportion of mothers who are employed either during pregnancy or within a year after childbirth, is unfortunately not available for New Zealand. Even in regard to the gen-

²⁷ New Zealand Official Year-Book, 1920, p. 23.

²⁸ For a full discussion of comparative rates see *Illegitimacy as a Child-Welfare Problem*, Part I, pp. 11-16, by Emma O. Lundberg and Katharine F. Lenroot, U. S. Children's Bureau Publication No. 66. For the New Zealand rates from 1877-1919 see General Table 9, p. 72.

²⁹ See reports on Infant Mortality, Results of field studies in Johnstown, Manchester, Waterbury, Brockton, Saginaw, New Bedford, and Akron, U. S. Children's Bureau Publications Nos. 9, 20, 29, 37, 52, 68, and 72; also Woodbury, Robert Morse: "Infant mortality studies of the Children's Bureau," in *Quarterly Publications of the American Statistical Association* (June, 1918), pp. 30-53, and *Save the Youngest*, U. S. Children's Bureau Publication No. 61 (revised).

eral economic level of the population the information is not as definite as could be wished, and where data are available it is for the most part impossible to bring together comparative material or to give satisfactory evidence of changes in the 50-year period under study.

In general, the economic level of the population may be regarded as comparatively high, and therefore as favorable to a low infant mortality rate. Of the total male population 10 years of age and over in 1916, 84.1 per cent were gainfully occupied.³⁰ This figure is slightly higher than the corresponding percentage, 81.3 per cent, of gainfully occupied males in the United States,³¹ but it must be remembered that the census of 1916 in New Zealand was taken after two years of war and that except for war conditions the proportion gainfully occupied might have been somewhat smaller.

Nearly three-tenths, 27.9 per cent, of the gainfully occupied males were independent; that is, they were either employers or were in business on their own account. Over three-fifths were receiving wages or salaries.³² Only 1.7 per cent were unemployed in October, 1916, a proportion very low in comparison with the proportion unemployed among trade-union members in England or the United States.³³ The figures for preceding censuses were also very low, 2 per cent in April, 1911, and 2.5 per cent in April, 1906.³⁴ There was little or no real poverty in the Dominion.

The average rate of wages in New Zealand was high in comparison with the cost of living.³⁵ The wages of unskilled workmen were higher relatively than those of skilled workmen.³⁶ This was due in part to the effect of the operation of the system of compulsory conciliation and arbitration by which, on application of a union of workmen or of employers to a conciliation board or council for the district, minimum wages for a trade are determined by the board or council, or, on appeal, by the arbitration court.

³⁰ Compiled from Results of a Census of the Dominion of New Zealand, 15th October, 1916, Part IX, Occupations and Unemployment, pp. 2-3.

³¹ Thirteenth Census of the United States, Vol. IV, Occupation Statistics, 1910, p. 65. In England and Wales in 1911, 83.8 per cent of the males 10 years of age and over were gainfully occupied. (Census of England and Wales, 1911. Vol. X, Occupations and Industries, Part I, p. cxxviii, Cd. 7018.) For comparative figures for European countries based upon population of all ages see Statistisches Jahrbuch für das Deutsche Reich, 1913, p. 13.

³² See General Table 8, p. 72. which gives also the distribution by occupation groups, and the proportion of employers and wage earners, etc., in each occupation group.

³³ Report on the Results of a Census of the Population of the Dominion of New Zealand, 15th October, 1916, pp. 4-5. For comparative figures for other countries than New Zealand see Unemployment Insurance, p. 15, by G. V. M. Turner. New South Wales Board of Trade. W. A. Gulick, Government Printer, Sydney, 1921.

³⁴ Report on the Results of a Census of the Population of the Dominion of New Zealand, 15th October, 1916, p. 136.

³⁵ For a discussion of wages, see New Zealand Official Year-Book, pp. 809-810, also pp. 800-935, article entitled "Wages and working hours in New Zealand, 1897-1919," by G. W. Clinkard; for a discussion of cost of living, see the same volume, pp. 771-807.

³⁶ *Ibid.*, p. 916.

In regard to the proportion of women at work, the percentage of females 10 years of age and over who were gainfully occupied in 1916 was 23.7 in New Zealand, as compared with 32.5 per cent in England and Wales in 1911, and with 17.1 per cent of the native whites of native parentage and 54.7 per cent of the negroes in the United States in 1910. In interpreting these figures it should be remembered that the proportion of women gainfully occupied in New Zealand in 1916 was probably abnormal, owing to war conditions.³⁷

Other facts which should be mentioned in this connection are the comparatively high proportion of homes owned, and the relatively large numbers of savings-bank deposits. Over half, 52 per cent, of the homes of New Zealand in 1916 were owned by the families that lived in them; 23.9 per cent were owned without encumbrance, 23.1 per cent were mortgaged, and 5 per cent were being purchased on time payments. In the United States in 1910, only 45.8 per cent of the dwellings were owned or partially owned by the families that lived in them.³⁸ The Government of New Zealand has fostered home ownership by means of various acts providing for loans to settlers, and for the erection of dwellings for workingmen.³⁹ In this connection mention should be made of the land legislation adopted in 1893 and later by which provision was made for leasing, on liberal terms, lands still held by the Crown, and in particular for splitting up large estates for the benefit of persons seeking to take up land. The number of depositors in the Post Office Savings Bank and in private savings banks in New Zealand in 1919 was 61 to every 100 of the population, and the average deposit in the Post Office Savings Bank at the end of the year 1918 was £56 12s. 5d. (\$275).⁴⁰

Evidence in regard to changes in economic conditions is even more unsatisfactory than that in regard to general economic conditions. In general it may be noted that an area of prosperity preceding 1882 was followed by a prolonged depression which lasted for 10 or 15 years, and during which emigration exceeded immigration; then prosperity returned, and immigration has since been flowing into New Zealand except when prevented by war conditions. So far as changes in wages are concerned, evidence based upon minimum hourly wages as fixed in awards under the conciliation and arbitration act indicates that real wages as measured by food prices

³⁷ See notes 30 and 31, p. 25.

³⁸ New Zealand Official Year-Book, 1919, p. 102. Thirteenth Census of the United States, Vol. I, Population, 1910, p. 1295.

³⁹ For a full account of this legislation see New Zealand Official Year-Book, 1919, pp. 672-678.

⁴⁰ Depositors in the Post Office Savings Bank as of Dec. 31, 1918, and depositors in private savings banks as of Mar. 31, 1919. Compiled from figures given in the New Zealand Official Year-Book, 1919, pp. 711-714.

and rents increased from about 1901 until 1911, fell during the following years until 1918, and increased again in 1919. But this conclusion does not take into account the decrease in hours of work, in consequence of which weekly earnings for full-time work without overtime decreased.⁴¹

The favorable conditions just reviewed, climate, homogeneity of population, a high level of intelligence, a low density, a low proportion of illegitimate births, favorable housing conditions, a high economic level, and absence of extreme poverty, go far toward explaining the relatively low infant mortality rate in New Zealand. As an explanation of the decrease in the infant mortality rate during the 50-year period under study, they either do not apply, if no change or if no improvement in the condition occurred, or apply only to a limited extent, since improvements in these conditions, where they occurred, were not pronounced. While on the one hand the conditions of living have doubtless been growing easier as the privations and discomforts of pioneering have given place to the conveniences of a more settled life, on the other, the proportion of the population living in cities, in which infant mortality rates are higher than in rural districts, has increased. However, the generally favorable conditions constitute a milieu in which measures of prevention will produce larger results than they would in communities where conditions were not so favorable.

GOVERNMENT ACTIVITIES RELATING TO THE WELFARE OF MOTHERS AND INFANTS.

The principal activities of Government departments and agencies which relate to maternal and infant welfare include general public-health protection, regulation of medical and nursing services, supervision and control of hospital facilities, control over production and sale of milk, the grant of maternity allowances to members of the National Provident Fund and of Friendly Societies, and the regulation of boarding homes for infants. The subsidies granted by the Government to the Royal New Zealand Society for the Health of Women and Children, the work of which is described in a later section of this report, should be mentioned in this connection.

In general the statements made refer to conditions as they existed in the early months of 1920. Since that date, however, one very important change has taken place in the health department in the creation of a new division of child welfare headed by Dr. Truby King, whose work in connection with the Royal New Zealand Society will be described later.

⁴¹ Clinkard, G. W.: "Wages and working hours in New Zealand, 1897-1919," in *New Zealand Year-Book*, 1919, pp. 910, 913.

General health protection.

Organization of the department of health.—Early laws and ordinances providing for quarantine, vaccination, control of epidemic diseases, and sanitation were incorporated in the public health act, 1876, which established a central board of health for the entire colony. A series of amendments modified various provisions of this act. All these were repealed and a department of public health was established by the public health act, 1900.

The present organization and authority of the department of health are regulated by the health act, 1920, which provides for a central administrative department under the general direction of the minister of health. The chief administrative officers of the department are the director general of health and his assistant, the deputy director general, both of whom must be medical practitioners with special qualifications in sanitary science.

The department has seven separate divisions: Public hygiene, hospitals, nursing, school hygiene, dental hygiene, child welfare, and Maori hygiene. School hygiene, dental hygiene, and child welfare are new in the department, although all three branches of work had been commenced in the education department.

The functions of the department are defined in broad terms. They include administration of the health act and all other public acts so far as their purpose is the promotion of health, advice to local authorities with reference to carrying out the health functions with which they are charged, prevention of infectious and other diseases, research and investigation relating to matters of public health and the prevention and treatment of disease, dissemination of information concerning public health, organization and control of medical, dental, and nursing services so far as they are paid for out of public funds, and generally securing the effective carrying out and coordination of measures conducive to public health.

The act provides for the establishment of a board of health composed of 11 members, as follows: The minister of health and the director general of health *ex officio*; three medical practitioners, of whom one must be a member of the medical board constituted under the medical practitioners act, 1914, and one a member of the medical faculty in the University of Otago; two persons, not medical practitioners, representing the New Zealand municipal and New Zealand counties associations; one civil engineer; one chairman of a hospital board; and two other persons, one of whom must be a woman deemed to be representative of the interests of women and children. The duties of the board are both administrative and advisory; it may require local authorities to provide sanitary works, to enforce the provisions and regulations under the act, and to make reports as to diseases and sanitary conditions.

For purposes of public-health administration, the Dominion is divided into health districts, each under a medical officer of health, who must possess special knowledge of sanitary and bacteriological science. These medical officers are appointed by the Governor General of the Dominion and are responsible to the director general of health.

Sanitation and prevention of infectious diseases.—Certain infectious and a list of other diseases are declared by law to be notifiable, and still others may be designated as notifiable by the Governor General by notice in the official gazette.⁴² The list of notifiable infectious diseases includes: Anthrax, cerebrospinal fever (cerebrospinal meningitis), cholera, dengue, diphtheria, erysipelas, enteric fever (typhoid fever, paratyphoid fever), leprosy, plague (bubonic or pneumonic), puerperal fever (puerperal septicæmia, puerperal sapræmia), scarlet fever (scarlatina), smallpox (variola, including varioloid, alastrim, amaas, Cuban itch, and Philippine itch), typhus, and yellow fever. Besides these notifiable infectious diseases the following are designated notifiable diseases: Actinomycosis anchylostomiasis (hookworm disease), bilharziosis (endemic hæmaturia, Egyptian hæmaturia), beriberi, hydatids, food poisoning (botulismus, ptomaine poisoning), chronic lead poisoning, phosphorus poisoning, and tetanus.

Notifiable diseases must be reported to the medical officer of health of the district by the medical practitioner in charge of the case, or by the occupier of the house if no medical practitioner is in charge. In case of a notifiable infectious disease the case must be reported to the local governmental authorities as well. Extensive powers for dealing with infectious diseases are given to the medical officer and to the local authorities; these apply to infectious diseases, such as measles, which are not designated as notifiable, as well as to the notifiable infectious diseases.⁴²

The act prescribes the procedure of quarantine and defines the powers of port health officers, who are charged with the enforcement of quarantine regulations.

Local authorities, including borough and county councils, town boards in districts not forming parts of counties, and similar bodies, are required to carry out the provisions of the act relating to sanitation under the general direction of the board of health and the director general. The board of health may require local authorities

⁴²The Health Act, First Schedule, 1920, listed the following as infectious but not notifiable; those declared notifiable by gazette notice since that date are marked with asterisks: Chicken pox* (varicella), encephalitis lethargica*, influenza, fulminant influenza*, pneumonic influenza*, septicemic influenza*, measles (morbil), German measles (rubella), mumps (epidemic parotitis), ophthalmia neonatorum*, acute primary pneumonia*, acute poliomyelitis* (infantile paralysis), ringworm of the scalp (tinea tonsurans), scabies (itch), trachoma* (granular conjunctivitis, granular ophthalmia, granular eyelids), tuberculosis* (pulmonary), whooping cough (pertussis).

to provide drainage and sewerage works, waterworks, means for the collection and disposal of garbage, refuse, etc., mortuaries, and other sanitary works. Each local authority is required to appoint one or more sanitary inspectors, whose qualifications are prescribed in the law, for the work of inspection and of enforcing the abatement of nuisances and of conditions dangerous to health. The act provides powers for the regulation of building, for the regulation of offensive trades, and for the prevention of pollution of watercourses, and authorizes local authorities to make by-laws to carry out its various provisions. The medical officers of health act in cooperation with local authorities in enforcing these provisions.

Social hygiene.—A social hygiene act was passed in 1917, and in 1919 a branch, known as the contagious diseases branch, was established in the health department to carry out the objects of the act.

The law provides that any person suffering from a venereal disease must consult a registered medical practitioner regularly until cured. Restrictions are placed upon the employment of such persons in handling food for human consumption. None but registered medical practitioners may treat persons suffering from these diseases.

The law further provides for treatment at public hospitals for cases of venereal diseases with subsidies from the Central Government of three-fourths of the cost. Special clinics have been established in the four chief centers.⁴³ In the absence of a hospital, a private practitioner is appointed and paid by the department for treatment given. In its present form the law is difficult of enforcement, but the provisions relating to subsidizing local public hospitals have tended to improve facilities for treatment.

Government aid in health protection.—The Central Government grants local government bodies and private organizations liberal subsidies in aid of public-health protection.

Local hospital boards are granted subsidies for the establishment and maintenance of hospitals. Contributions raised by local boards to meet capital expenditures are subsidized by the Central Government pound for pound, while taxes for current expenditures are subsidized according to a somewhat complicated scale, varying from 12s. 3d. (\$2.97) to 24s. 3d. (\$5.89) for each pound (\$4.87).⁴⁴ Income derived from voluntary contributions or gifts is subsidized by the Government at a rate of 24s. (\$5.84) for every pound (\$4.87), and bequests are subsidized at a rate of 10s. (\$2.43) for every pound, not, however, to exceed £500 (\$2,433) subsidy in respect of any one testator.

⁴³ For a brief description of the work under this act, see "Treatment of venereal disease in New Zealand," by S. McWilliams, in *New Zealand Journal of Health and Hospitals*, Vol. IV (April, 1921), pp. 85-86.

⁴⁴ For details see fourth schedule, the hospital and charitable institutions act, 1909, No. 11.

As already stated, special subsidies equal to three-fourths of the cost are granted hospitals which provide special facilities for the treatment of venereal diseases.

In a few country districts which are unable themselves to support nurses or midwives the Central Government makes special provision by stationing there midwives or nurses and paying their salaries. The health department is reimbursed in part by fees from patients. This service has only recently been established and its extent is not great.⁴⁵

Mention should be made in this connection of the establishment and maintenance of the St. Helen's Hospitals by the central department; a full description of the work of these hospitals is given below.

The Government pays the entire cost of maternity bonuses granted at the birth of each child to members of the National Provident Fund and of approved Friendly Societies.

Liberal subsidies are granted by the Central Government in aid of the work of the Royal New Zealand Society for the Health of Women and Children, the work of which is described later.

Regulation of medical and nursing services.

Registration of medical practitioners.—The early provincial ordinances regulating the practice of medicine were incorporated in the medical practitioners act, 1867, which was repealed two years later by the medical practitioners act, 1869. According to the latter act, persons registered or entitled to register in the United Kingdom or qualified for practice by completing a regular course of medical study of not less than three years' duration were entitled to be registered in New Zealand. In 1905 the length of the prescribed course of study was increased to five years.⁴⁶

According to the medical practitioners act, 1914, a person is entitled to be registered as a medical practitioner if he is a graduate in medicine and surgery of the University of New Zealand, or is on or eligible to be placed on the register of the United Kingdom, or if he has a diploma from an approved institution granted after five years' study of the subjects pertaining to a medical or surgical degree or license. Applications are made to the registrar of births and deaths at Wellington or at one of the other principal cities. One month's notice must be given for registration, and the application must be advertised in the New Zealand Gazette and in a newspaper near the place of the applicant's residence. The medical practitioners act of 1914 established a medical board, including the inspector general of hospitals and six other medical practitioners

⁴⁵ Compare Public Health and Hospitals and Charitable Aid Report, 1919. "II-31," p. 11. See also "State medical service," by Dr. R. H. Makgill, in New Zealand Journal of Health and Hospitals, Vol. IV (January, 1921), pp. 1-7.

⁴⁶ Medical practitioners registration act, 1905, No. 31, sec. 4.

appointed by the Governor General for a term of three years each, and this board deals with all questions relating to registration of medical practitioners.

In this connection mention should be made of the medical school established in 1876 at Dunedin as part of the University of Otago. In that year arrangements were made for the first two years of a medical course; in 1883 steps were taken to complete the curriculum, and a full five years' course of instruction was provided.⁴⁷ This school is the only school in New Zealand preparing students for medical and surgical practice. In connection with the medical school the Batchelor Hospital at Dunedin provides facilities for the training of students in obstetrics.⁴⁸ In 1904 the medical school was authorized to grant the degree of doctor of public health in addition to the medical and surgical degrees;⁴⁹ in 1912 this authority was vested in the senate of the University of New Zealand, of which the University of Otago is a part.

According to census returns given in Table XIII the number of medical practitioners in proportion to population remained practically stationary from 1891 to 1901, but increased from 5.7 per 10,000 population in 1901 to 6.9 in 1911. In 1916, the proportion fell to 4.6 per 10,000. The small proportion in 1916 was doubtless due to the absence of many physicians in military and naval service.

Besides these figures, which relate to medical practitioners enumerated on the dates of the different censuses, a register is kept of medical practitioners licensed to practice. The number on the register since January 1, 1914, is shown in General Table 6. For comparative purposes, however, the census figures, including only those present and enumerated in New Zealand, appear to be the more significant.

TABLE XIII.—*Medical practitioners, New Zealand, 1891-1916.*^a

Date of census.	Medical practitioners enumerated in census		Date of census.	Medical practitioners enumerated in census.	
	Number.	Per 10,000 population.		Number.	Per 10,000 population.
1891.....	362	5.8	1906.....	601	6.8
1896.....	411	5.8	1911.....	692	6.9
1901.....	438	5.7	1916.....	503	4.6

^a Compiled from Results of a Census of the Dominion of New Zealand, 5th April, 1891, p. 246; 12th April, 1896, p. 359; 31st March, 1901, p. 389; 29th April, 1906, p. 450; 2d April, 1911, p. 501; 15th October, 1916, Part IX. Occupations and Unemployment, p. 73.

⁴⁷ New Zealand Official Year-Book, 1896, p. 344.

⁴⁸ New Zealand Official Year-Book, 1919, p. 214. See also Public Health and Hospitals and Charitable Aid Report, 1919, "H-31," p. 12, for change in regulations of the St. Helen's Hospital, Dunedin, permitting admission of medical students into its maternity ward.

⁴⁹ New Zealand Official Year-Book, 1907, p. 170; 1919, p. 205.

Registration of nurses.—The nurses' registration act was passed in 1901. The principal provisions of the act, as incorporated in the consolidated statutes of 1908, are as follows:

Nurses who have attained the age of 23 years and who are certified as having had three years' training in a hospital, together with systematic instruction in theoretical and practical nursing from the medical officer and the matron of the hospital, are entitled to registration after having passed a satisfactory examination under the act and on payment of the required fee. Any person who had received four consecutive years of training in a hospital prior to January 1, 1902, when the original act came into operation, was entitled to registration after passing the required examination and upon payment of the fee. Persons admitted to practice outside New Zealand may be registered if the training received is recognized by the minister as equivalent to the training and examination required of New Zealand nurses.

Detailed regulations govern the course of study and supervision of hospitals where pupil nurses are trained.

Registration may be canceled in case of conviction of a nurse of an indictable offense or in case of grave misconduct.

Registration of nurses is not compulsory. Registered nurses, however, are given preference of employment in vacancies occurring in hospitals under the control of hospital and charitable aid boards.

The number of nurses who passed the prescribed examinations during the 10-year period 1910–1919 was 1,411, and the number of nurses on the register March 31, 1919, was stated as 2,433.⁵⁰

Registration of midwives.—Registration of midwives was first required under the midwives act, 1904, which also provided for the formulation of a standard course of training. That act provided for the registration of women holding certificates in midwifery granted after completion of the course of training prescribed by the act, or holding certificates from recognized training schools of midwifery or from the Obstetrical Society in London, or other certificates approved by the registrar of midwives.

Certificates under the midwives act are granted to nurses who have attended lectures at a State maternity hospital or other institution approved by the registrar, for 6 months if the nurse is registered under the nurses' registration act, or for 12 months in other cases,

⁵⁰ New Zealand Official Year-Book, 1919, p. 215. The figure 1,411 is found by adding the numbers given as having passed the examinations in each of these years ending Mar. 31 from 1910 to 1919, as given in the yearbooks 1910, p. 334; 1911, p. 422; 1912, p. 490; 1913, p. 194; 1914, p. 201; 1915, p. 229; 1916, p. 153; 1917, p. 145; 1918, p. 182; 1919, p. 215. The number given as on the register Mar. 31, 1919, is greater, however, than the sum of the number 879 on the register Mar. 31, 1910, and the number 1,311 entitled to registration by passing the prescribed examination during the period Mar. 31, 1910, to Mar. 31, 1919. Others may have been registered as having equivalent qualifications because of training received outside New Zealand.

who have attended at least 20 cases of confinement, and who pass a satisfactory examination.

Persons who had already been practicing for a period of at least three years when the law went into effect were entitled to registration without examination, provided they satisfied the registrar that they were of good character.

Notice of intention to practice midwifery must be given annually to the registrar. Registration may be canceled in case of conviction for an indictable offense or in case of malpractice or misconduct. The district health officer is constituted the local supervisory authority over midwives in his district.

The board of health publishes a pamphlet of rules for the guidance of midwives in which the principal points of the act are summarized. There are, in addition, detailed specifications as to equipment and a detailed statement of conditions under which medical help should be sent for. If a midwife neglects or refuses to send for a doctor in any case so specified, her registration as midwife becomes subject to cancellation.

Persons not registered as midwives who practice or use the name of midwife are liable to a fine not exceeding £20 (\$97). The penalty does not apply to assistance rendered in cases of emergency.

The department of health, when it receives information through the office of the registrar of births or from any other source, that a person not registered as a midwife has attended a confinement, notifies the person of her liability to fine under the law and institutes prosecution unless it is shown that the case was in the nature of an emergency.

In Table XIV the number of registered midwives and the number of trained and certified midwives are given for the period from 1907 to 1920. In 1918 slightly over half those on the register had been trained and certified, the remainder having been in practice at the time the act went into effect. The law thus provides, in practice, for the gradual substitution of trained midwives for those in practice at the time the act went into force, who may or may not have had adequate training. It thus definitely raises each year the level of midwifery care available for the mothers of New Zealand.

TABLE XIV.—Registered midwives, New Zealand, 1907-1920.¹

Year ended Mar. 31—	Registered midwives.		Year ended Mar. 31—	Registered midwives.	
	Total on register.	Trained and certified.		Total on register.	Trained and certified.
1907.....	890	104	1914.....	1,278	595
1908.....	996	² 149	1915.....	1,373	690
1909.....	1,004	³ 149	1916.....	1,431	742
1910.....	1,155	283	1917.....	1,497	842
1911.....	1,017	341	1918.....	1,519	888
1912.....	1,098	415	1919.....	⁴ 2,508	989
1913.....	1,189	594	1920.....	⁵ 2,638	1,119

¹ Source: New Zealand Official Year-Book, 1907, p. 442; 1908, p. 251; 1909, p. 254; 1910, p. 333; 1911, p. 421; 1912, p. 190; 1913, p. 194; 1914, p. 201; 1915, p. 223; 1916, p. 153; 1917, p. 145; 1918, p. 182; 1919, p. 215; 1920, p. 62.

² Ibid., 1908, p. 251, given as for 1907, but the figure does not agree with that given in 1907 yearbook, p. 442, for the year 1907.

³ Stated as for 1908, but see preceding note. The figure given in the next yearbook is for 1910.

⁴ Ibid., 1919, p. 215. Evidently an error due to adding to the number on the register the preceding year the total number trained and certified instead of the number newly certified less deaths and withdrawals. Should probably not exceed 1,620.

⁵ See preceding note. Should probably not exceed 1,750.

Hospitals.

St. Helen's Maternity Hospitals.—Under the midwives act of 1904 the establishment of one or more State maternity hospitals was authorized. They were designed not only to provide facilities for training midwives and maternity nurses but also to provide skilled assistance at confinement for wives of workingmen, at a moderate fee. The first of these State maternity hospitals, or St. Helen's Hospitals as they are called, was opened at Wellington in the year 1905. Three others were opened soon after, one at Dunedin in October, 1905, one at Auckland in June, 1906, and one at Christchurch in April, 1907. More recently, in November, 1915, one was established at Gisborne, and in March, 1918, another at Invercargill.

As already stated, the midwives act specified that nurses trained in St. Helen's Hospitals, after completing a prescribed course of training and passing a satisfactory examination, might be admitted to practice as midwives or maternity nurses. The fees for the course of training are low—only £10 (\$48.66) for the 6-month course for registered nurses, and £20 (\$97.33) for the 12-month course for others. It should be mentioned in this connection that the department of health remits the fee for the course of training in case the woman, when qualified as midwife, serves for a period of two years in some district which is in especial need of the service of a midwife and is unable otherwise to secure such services.

The wives of workingmen who have incomes of less than £350 (\$1,703.28) a year may avail themselves of the services of these hospitals.⁶¹ A small charge, 30s. (\$7.30) a week, is made for care during the confinement period if the confinement takes place in a

⁶¹ New Zealand Journal of Health and Hospitals, Vol. IV (January, 1921), p. 14.

St. Helen's Hospital; patients admitted for special treatment before confinement are charged £1 (\$4.87) a week, while babies are re-admitted for treatment at a rate of 10s. (\$2.43) a week. The charge for a nurse's attendance at confinement at the home of the patient and 10 daily visits is £1 (\$4.87).

These hospitals not only provide for the confinement period but also give a certain amount of prenatal supervision and of advice on the care of infants. Their medical officers are in attendance at special hours on certain days, when any woman desiring medical advice during pregnancy may secure it free of charge, whether she is registered to have her confinement at the St. Helen's Hospital or not. Expectant mothers who have registered to have their confinements at the St. Helen's Hospitals are urged to come in about the beginning of the seventh month of pregnancy, and if any untoward symptoms are present a thorough examination by a physician is given. At these hospitals mothers are kept in bed at least 10 days and in the hospital at least 14 days after confinement. Afterwards they are visited at intervals by the hospital nurses, who give them advice as to the care and feeding of their infants. This feature of the work is, however, not systematic. Sometimes mothers are referred to the Plunket nurses, as the nurses of the Royal New Zealand Society for the Health of Women and Children are called.⁵²

During the year ended March 31, 1919, as shown in Table XV, 1,123 confinements took place in the six hospitals, and 521 confinements which occurred outside the hospitals were attended by St. Helen's nurses. Of the total number of births in the Dominion, about 1 in every 23 took place in a St. Helen's Hospital; including those outside the hospitals attended by the institution nurses, about 1 in every 16 was attended by a St. Helen's nurse.⁵³

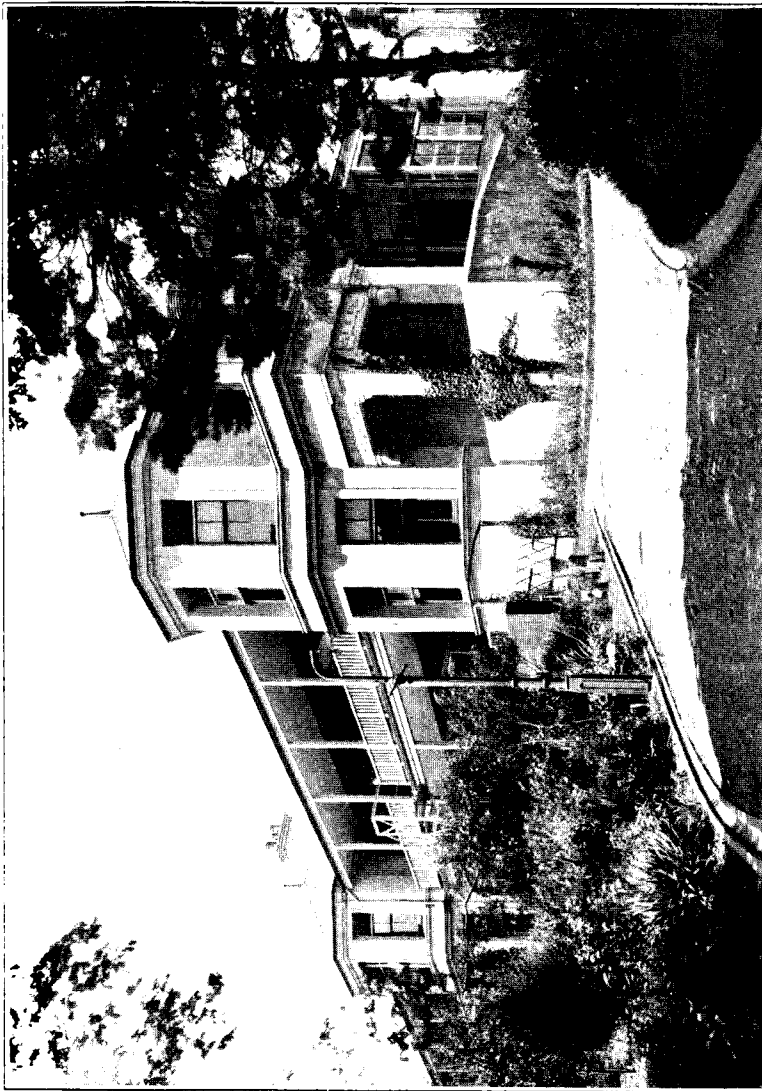
TABLE XV.—*Births attended by St. Helen's nurses, 1907-1920.*^a

Year ended March 31—	Births attended by St. Helen's nurses.			Year ended March 31—	Births attended by St. Helen's nurses.			Year ended March 31—	Births attended by St. Helen's nurses.		
	Total.	In St. Helen's Hospitals.	Outside St. Helen's Hospitals.		Total.	In St. Helen's Hospitals.	Outside St. Helen's Hospitals.		Total.	In St. Helen's Hospitals.	Outside St. Helen's Hospitals.
1907....	718	564	154	1912....	1,346	886	460	1917....	1,594	1,071	523
1908....	822	662	160	1913....	1,374	920	454	1918....	1,778	1,248	530
1909....	1,128	806	322	1914....	1,298	803	495	1919....	1,644	1,123	521
1910....	1,185	865	320	1915....	1,204	794	410	1920....	1,691	1,139	552
1911....	1,182	827	355	1916....	1,361	798	563				

^a Source: New Zealand Official Year-Book, 1908, p. 257; 1909, p. 254; 1910, p. 333; 1914, p. 200; 1919, p. 214; 1920, p. 61. There are slight discrepancies in the figures for certain years; e. g., the figures for 1910 are given as 865 in and 320 outside the St. Helen's Hospitals in the 1914 yearbook, while they are given as 875 and 328 in the 1910 yearbook (p. 333); and the figures for 1913 are stated as 920 and 454 in the 1914 yearbook, but as 909 and 452 in the 1913 yearbook (p. 193).

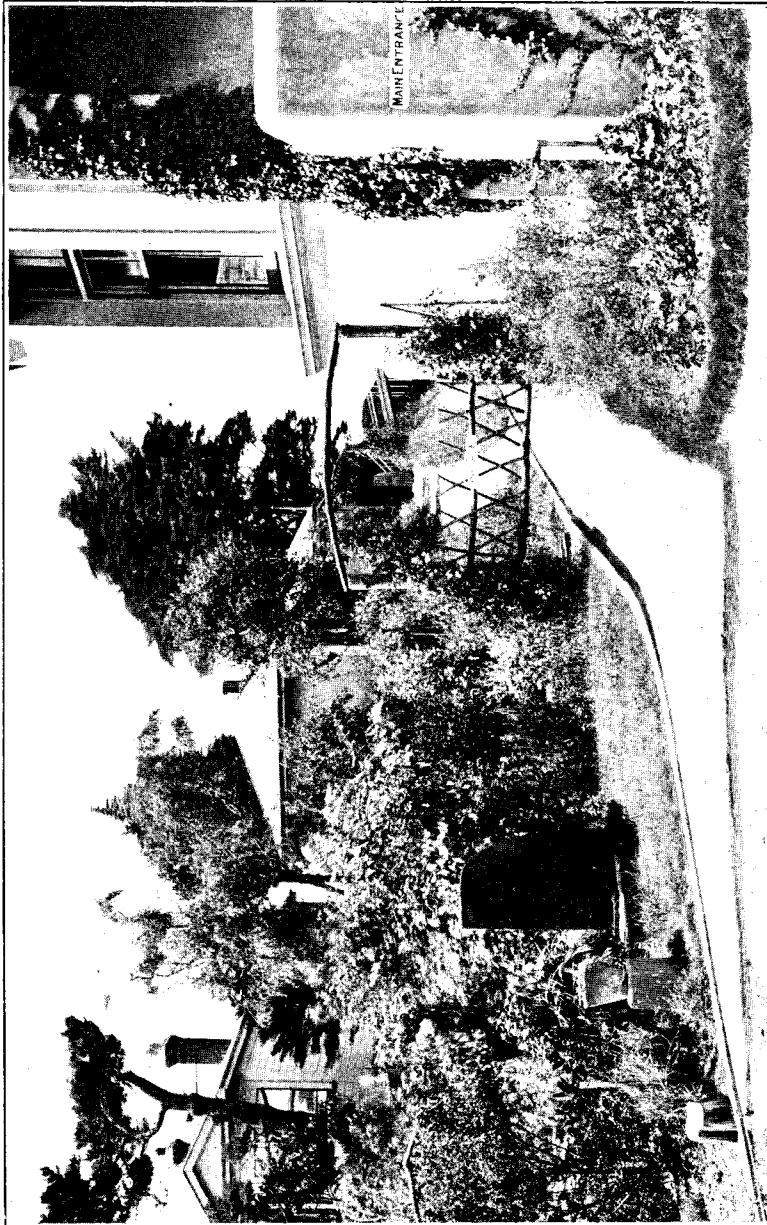
⁵² See p. 48.

⁵³ New Zealand Official Year-Book, 1919, p. 214.



THE ST. HELEN'S HOSPITAL. WELLINGTON, NEW ZEALAND.

1241



VIEW OF THE GROUNDS, ST. HELEN'S HOSPITAL, WELLINGTON, NEW ZEALAND.

36-2

Public general hospitals.—Public general hospitals are established by and are under the control of local hospital boards and are subject at all times to inspection by the director general of health or his deputies. Moderate fees are charged for care and treatment in these hospitals.

The number of public general hospitals increased from 36 in 1880 to 65 in 1919. Besides these, there were, in 1919, 4 fever and infectious disease hospitals and 5 sanatoria for consumptives.⁵⁴

During 1919, 393 normal confinements occurred in public hospitals in addition to those which occurred in the St. Helen's Maternity Hospitals.⁵⁵

Special mention should be made of the system of medical, nursing, and hospital facilities provided, since 1909, for country districts. Cottage hospitals are established and maintained in a number of the more remote districts by the hospital boards. Nurses are appointed for work in the country districts; physicians are subsidized to take up practice in districts where otherwise they would have difficulty in making a living. Besides this provision by the local boards, the Central Government maintains a number of district nurses in the back blocks, as the remote country districts are called, principally in regions where the Maoris are in preponderance and district midwives, paid for wholly by the Central Government, are stationed in a number of the smaller towns. In these ways the smaller communities have access to medical and nursing services which unaided they could not support.

Private hospitals.—Private hospitals are regulated under the hospitals and charitable institutions act, 1909 (No. 11). Under the provisions of this act all private hospitals are required to be licensed. Application for license must contain a detailed description of the hospital and a statement as to the uses to which the different rooms are to be put and the number and kind of cases to be received. It is further provided that the resident manager of the hospital, if not a registered medical practitioner, must be, in case of a licensed maternity hospital, a registered midwife; in case of a medical and surgical hospital, a registered nurse; or, in case of a hospital licensed both as a maternity hospital and as a medical and surgical hospital, a registered nurse who is also a registered midwife or who has as an assistant a registered midwife. A complete register of patients must be kept open to inspection. Licensed hospitals are subject to visit and inspection in the same manner as public hospitals.

⁵⁴ Statistics of New Zealand, 1880, Vital Statistics, p. 52. New Zealand Official Year-Book, 1919, p. 212; 1929, p. 60.

⁵⁵ Statistics of the Dominion of New Zealand for the year 1919, Vol. I, p. 174. Besides these cases of normal labor, 1,066 cases (discharges and deaths) of women were treated for diseases connected with the puerperal state. *Ibid.*, p. 174.

The act defines as a private hospital any house in which two or more patients are received and lodged at the same time, other than institutions under the control of hospital boards and hospitals wholly or mainly supported by the State.

A license may be revoked in case the premises are deemed by the inspector general to be insanitary, in case the hospital is conducted in such a way that revocation is demanded in the public interest, in case the licensee or manager has been convicted of an offense against the act or any offense punishable by imprisonment, or if the licensee has failed to pay the annual fee.

At the close of the year 1919 about 240 private hospitals were in operation.⁵⁶

A number of private hospitals provide maternity care, but unfortunately no complete statement of the number of confinements or births that occur in them is available. During the year ended March 31, 1919, 238 confinements occurred in 6 maternity homes maintained by the Salvation Army in the larger cities:⁵⁷ a large proportion of the confinements in these hospitals were of girls illegitimately pregnant.⁵⁸ Besides these, in the year ended March 31, 1919, the Bachelor Hospital, an institution connected with the Medical School of the New Zealand University at Dunedin, cared for 126 confinements, the McHardy Maternity Home, Napier, 141; the Maternity Home, Blenheim, 82; and the Essex Maternity Home, Christchurch, 21, while in the Alexandra Home, Wellington, 99 births occurred.⁵⁷

Recent returns from 178 private hospitals for the two-year period July 1, 1919, to June, 1921, show a total of 15,838 confinements, or an average of about 7,900 confinements in these private hospitals each year.⁵⁹

Control over milk supply.

Regulation of production of milk.—In regard to milk supply, the department of agriculture has supervision until the milk leaves the dairies, while the department of health controls the storage and sale. The two principal acts regulating production of milk are the dairy industries act, 1908, and the stock act of the same year. The provisions of these two acts are enforced by inspectors under the department of agriculture.

According to the dairy industries act, 1908 (No. 37), and the regulations thereunder, all dairies producing milk for sale have to be

⁵⁶ New Zealand Official Year-Book, 1920, p. 61.

⁵⁷ Public Health and Hospitals and Charitable Aid Report, "H-31," p. 13. New Zealand, 1919.

⁵⁸ *Ibid.*, p. 12. See also Report on the Work of the Royal New Zealand Society for the Health of Women and Children, p. 5, by Dr. Margaret Harper. Royal Society for the Welfare of Mothers and Babies, Sydney, N. S. W., 1920.

⁵⁹ Report of the Director General of Health, New Zealand for the Year Ended 31st March, 1921, "H-21," p. 24.

registered with the inspector of stock in the district. Registration is made only after inspection and approval of the premises, and has to be renewed annually. Such premises are subject to inspection at any time. Among other things, the inspectors have power to order any unsatisfactory condition remedied, and to prohibit the sale of milk from any dairy which does not come up to standard. Provision is made for supervision over construction of dairies, and plans for new dairies have to be approved before work is commenced. No person suffering from an infectious or contagious disease is allowed to handle milk.

Under the stock act, 1908 (No. 187), cattle suffering from infectious disease may be condemned by an inspector. The owner is compensated at half the market value. Upon request, or whenever there is reason to suspect the presence of tuberculosis, cows are tested with tuberculin free of charge. No general testing for tuberculosis has been undertaken. Samples of milk from herds supplying the chief centers are taken and examined for tubercle bacilli. In the years 1918-19 the results of these examinations were negative in all cases.

Regulation of sale of milk.—Under the sale of food and drugs act, which was passed in 1907, the oversight over the quality and condition of milk sold was placed in the department of public health. Under the authority of this act, regulations were published in the official gazette in 1907 which for the first time in the Dominion laid down a standard for milk sold.⁶⁰

The regulations in force in 1919 prescribed a standard for the percentages of butter fat and of other solids, and a standard in regard to bacterial condition,⁶¹ besides provisions for securing cleanliness and freedom from contamination of milk.⁶²

In the administration of the sale of food and drugs act, the department of health had, in 1919, 31 inspectors directly under its supervision. Besides these, in many districts other inspectors work under the direction of the local hospital boards. The agents of the department collect samples from the vendors of milk, the samples are submitted to analysis, and prosecutions may be instituted if the milk is found to have been watered, or to be below standard in the percentage of butter fat and other solids or otherwise not in good condition.

Special bacteriological tests of milk are made, when requested, in the Dominion laboratory of the department of health.

⁶⁰ Watt, Dr. M. H. (director, division of public hygiene, department of health): "Infant mortality in New Zealand," in *New Zealand Journal of Health and Hospitals*, Vol. IV (April, 1921), p. 89.

⁶¹ The regulation in the matter of milk souring provides that the milk when sold must be in such condition that in the reductase test it will not decolorize the methylene blue in less than three hours. *New Zealand Gazette*, No. 40, Mar. 21, 1918.

⁶² The principal provisions of the regulations for the sale and storage of milk in force in 1919 are given in Appendix B.

During the year 1918, 50 convictions were secured for adulterated milk or for milk not up to standard, and fines of £654 4s. 1d. (\$3,183.67) were imposed. Of these convictions, 17 were in the Wellington district, 9 in Auckland, 6 in North Canterbury, and 5 in the Nelson district.

In general, so far as could be learned, no system of refrigeration of milk either during transportation by rail or during delivery by milk cart was in use in New Zealand. The general practice, furthermore, was to sell from the can; the delivery of milk in bottles now so generally required in American cities, was practiced only in special cases, such as that of the "humanized" milk prepared for individual babies in Dunedin.⁶³ In this connection, however, it is necessary to bear in mind the relatively short distances from farm to consumer, and the cool climate.

Wellington municipal milk.—An interesting development of the last decade is the taking over of the milk supply of Wellington by the municipality. Wellington is the most unfavorably situated city in New Zealand, so far as the milk supply is concerned, being cut off from the dairy districts by high hills. Practically all the milk has to come in by rail from distances ranging from 7 or 8 miles to 15 or 20.

By an act of November 4, 1919, the city council was given complete authority over the sale and distribution of milk in Wellington. By authority of this act the city took over the handling of the entire milk supply entering the city. In 1920 it was buying all the milk from the dairymen and, after Pasteurizing it, was selling it to the private dealers to distribute.

At the central Pasteurizing plant every precaution was taken to insure cleanliness; the cans in which the milk was received from the dairies and those in which it was sent to the distributors in the city were completely sterilized. Samples were taken daily of the milk received from each dairyman, and were subjected to analysis for butter fat and to the "reductase test" for determining bacterial condition; if milk was not up to the standard, the dairyman furnishing it was first warned and then, if he still failed to meet the requirements, was dropped from the number of producers selling milk to the city.

The city was divided into five districts, and the four principal companies were each allowed exclusive rights in one of these; in the fifth district a few small local distributors were allowed to sell milk and any of the four companies as well. The city itself sold milk at retail at its central plant, and on request also delivered milk in quantity to the larger hotels and similar establishments.

⁶³ See p. 60.

The city is authorized, however, not only to purchase and Pasteurize, but also to distribute milk, and the arrangement for distribution by private companies was intended merely as a measure of transition. The plan provides that after three years the city shall take over the actual distribution of milk to the private consumer and shall deliver the milk in bottles. During this transition period of three years the difference between the price which the city charges the distributing companies and the price they are allowed to charge the public is so measured as to provide the companies compensation for the good will of their business.

Maternity allowances.

Although the Government of New Zealand has no general system, like the Australian, of maternity bonuses, it does grant allowances for births to members of the National Provident Fund and, beginning with 1917, to members of approved Friendly Societies, as the voluntary societies which provide benefits for their members in cases of sickness, old age, or invalidity, are called. A brief description of the provident fund and of the conditions under which maternity allowances are granted is therefore of interest in considering the subject of infant mortality.

The National Provident Fund was established by an act passed in 1910, and went into operation on March 1, 1911. Its chief purpose was to provide facilities by which New Zealand residents could accumulate funds for pensions in old age. Any resident of New Zealand over 16 and under 50 years of age may join the fund provided his average income prior to joining does not exceed £300 (\$1,460) a year. Besides pensions for old age, benefits are given in case of incapacity for work, and to the widows and orphans of members.⁶⁴ These pensions are paid from contributions by members of the fund, to which a State subsidy is added.

In addition to the regular benefits, a payment of £6 (\$29.20) is made, upon the birth of a child, to any member of the fund of at least 12 months' standing. This payment is made from a special Government grant for this purpose; no part of the cost of the maternity allowance is borne by the contributor himself.

Among the conditions for the grant of the maternity allowance are the following: For the period of 12 months immediately preceding the birth of the child the joint income of the father and mother must not have exceeded £300 (\$1,460); and since becoming a contributor the applicant must not have been absent from New Zealand for a period of 2 years at any one time, or 5 years in the aggregate (absence

⁶⁴ Details of the conditions under which pensions are granted may be found in the *New Zealand Official Year-Book*, 1919, pp. 702-704; the reference, however, does not incorporate changes made by the national provident fund amendment act, 1919, No. 26.

in the military force or public service, however, is excepted). Maternity allowances are granted for legitimate births only.

The provisions of the original act of 1910 specified that the board in whose hands the administration of the fund was placed might reduce the amount of the maternity benefit to the sum actually expended for medical services, including the services of a medical practitioner, midwife, and nurse. This limitation was repealed by an amendment passed in 1919, since in practice it was found that few persons spent less than the amount provided for medical service, and that therefore the full amount was granted in practically all cases. The board may still require a report of the amounts expended in medical service.

An important amendment to the law was passed in 1916 by which maternity allowances of £4 (\$19.16) were granted by the Government to members of any approved Friendly Society upon approximately the same conditions as to members of the provident fund. The amount was raised to £6 (\$29.20) by an amendment of October 31, 1919.

Details of the numbers of maternity allowances granted during the years 1912-1918 are shown in Table XVI. Prior to 1917 maternity allowances were granted for less than 2 per cent of the births in New Zealand. In 1917 and 1918, when allowances were granted to members of Friendly Societies, the proportion of births for which maternity allowances were granted rose to nearly 16 per cent.

TABLE XVI.—*Maternity benefits granted to members of the National Provident Fund or approved Friendly Societies, 1911-1918.*¹

Year ended Dec. 31—	Births.	Cases receiving maternity benefits.			
		Total.		National Provident Fund.	Approved Friendly Societies.
		Number.	Per cent of births.		
1912.....	27,508	31	0.1	31	.....
1913.....	27,935	119	.4	119	.....
1914.....	28,338	306	1.1	306	.....
1915.....	27,850	472	1.7	472	.....
1916.....	28,509	634	2.2	634	.....
1917.....	28,239	3,360	11.9	677	2,683
1918.....	25,860	4,120	15.9	668	3,452

¹ Source: Manuscript figures furnished by courtesy of the National Provident Fund.

The prime object of the grant of maternity allowances for members of the National Provident Fund was the encouragement of thrift; since the attempt regularly to lay by savings for old age was in many cases interrupted or made impossible by extra expenses incident upon childbirth, allowances were granted to insured members

of the fund in order to enable them to continue with their regular contributions to the fund. Though practically all the money granted appears to have been expended for medical and nursing services, no information is available to show whether the grant of maternity allowances has actually raised the level of confinement and nursing care in the families which received them.

Regulation of boarding homes for infants.

The infant life protection act was first passed in 1896. It provided that infants under 4 years of age boarded out for reward apart from their mothers should be placed only in licensed homes. The powers of licensing and inspection were at first given to the police. It might be mentioned that this act was first passed on account of the discovery of a flagrant case of baby farming in which, after the premiums had been paid, the infants had been practically murdered.

In 1907, in order to improve the system of licensing and inspection, the powers of administration were transferred from the police to the education department. At the same time the age of infants to whom the provisions of the act applied was raised to 6 years. The act is administered by the special schools branch of the education department. The inspectors are all trained women with nurses' certificates.

Table XVII shows the number of children under 4 years of age in foster homes from 1898 to 1905, and the number of deaths among them. These rates are not infant mortality rates, since children up to 4 years of age were included, and since a child was counted for each calendar year during which he spent even a short period in the home. Nevertheless the decrease in the death rate from 1898 to 1905 probably reflects a corresponding decline in the death rate among infants in foster homes, since the great majority of deaths were undoubtedly of babies under 1 year of age.⁶⁵ On account of the absence of data, no exact comparison can be made of mortality among infants boarded out apart from their mothers before and after the enactment of this legislation.

⁶⁵ Thus of the 184 deaths among children under 6 years of age in foster homes from 1908 to 1918, 139, or 76 per cent, were of infants under 1 year of age.

TABLE XVII.—*Decline in death rate among children under 4 years of age in foster homes, 1898-1905.*¹

Year ended Mar. 31—	Children under 4 years of age in foster homes.			Year ended Mar. 31—	Children under 4 years of age in foster homes.		
	At any time in year.	Deaths.			At any time in year.	Deaths.	
		Number.	Per 100 in homes at any time in year.			Number.	Per 100 in homes at any time in year.
1898.....	829	27	3.3	1902.....	936	² 44	² 4.7
1899 ².....	.....	.....	.....	1903.....	854	28	3.3
1900.....	872	26	3.0	1904.....	728	21	2.9
1901.....	943	29	3.1	1905.....	862	20	2.3

¹ Source: Commissioner's Reports as abstracted in New Zealand Official Year-Book, 1900, p. 120; 1903, p. 405; 1904, p. 261; 1906, p. 214; and 1907, p. 442. The reference in the 1907 yearbook does not specify the year to which the figures, 862, etc., refer, but from similar statements in other yearbooks it is inferred that they refer to the year 1905.

² Not stated in source.

³ An epidemic of scarlet fever and measles is cited as an explanation of the high mortality in 1902.

Table XVIII shows the decline from 1908 to 1918 in the mortality among infants under 1 year of age who were boarded out in foster homes. For this period, during which the education department had charge of the inspection and licensing service, the death rate per 1,000 infants in foster homes fell from 143 in 1908 to only 21 in 1918. These rates, which are based upon estimated average numbers of infants under 1 year of age in foster homes, indicate clearly a striking decline in the infant death rates. It should be borne in mind, however, that since the majority of these infants were probably over 2 weeks of age before they were boarded out, the mortality rate among them is not exactly comparable to an infant mortality rate for the entire first year of life.⁶⁶

TABLE XVIII.—*Decline in death rate among infants under 1 year of age in foster homes, 1908-1918.*^a

Year.	Infants under 1 year of age in foster homes.			Year.	Infants under 1 year of age in foster homes.		
	Esti- mated average number. ^b	Deaths.			Esti- mated average number. ^b	Deaths.	
		Number.	Per 1,000.			Number.	Per 1,000.
1908.....	154	22	143	1914.....	198	17	86
1909.....	187	19	102	1915.....	210	9	43
1910.....	156	19	122	1916.....	183	16	55
1911.....	150	8	53	1917.....	181	10	55
1912.....	168	10	60	1918.....	191	4	21
1913.....	173	11	64				

^a Compiled from Reports of Education Department, New Zealand, Education: Special Schools, and Juvenile Probation System and Infant-Life Protection, 1909-1919.

^b Found by averaging the numbers on the books at the beginning and the end of the year. The number of different infants is much greater than this average number. See General Table 2, p. 70.

⁶⁶ Further details of admissions and withdrawals are given in General Table 2, p. 70.

Figures are also available showing the mortality among infants under 1 year of age in institutions exempted from certain provisions of the act.⁶⁷ Table XIX indicates that in these institutions a marked decline in the death rate has taken place during the period of 1909 to 1918. The rate per 1,000 individual infants cared for fell from an estimated 236 in 1909 to 60 in 1918, a decrease of nearly three-fourths. If the deaths are compared to the estimated average number of infants in these institutions, the rate, which much more closely approximates an infant death rate, appears much less favorable; but the fact of a marked decrease in the rate is clearly established.

TABLE XIX.—Decline in the death rate among infants under 1 year of age in institutions exempted from certain provisions of the infant life protection act, 1909-1918.¹

Infants under 1 year of age in exempted institutions. ²					Infants under 1 year of age in exempted institutions. ²				
Year.	At any time in year. ³	Deaths.		Estimated average number. ⁴	Year.	At any time in year. ³	Deaths.		Estimated average number. ⁴
		Number.	Per 1,000 at any time in year.				Number.	Per 1,000 at any time in year.	
1909.....	237	56	236	76	1914.....	289	26	90	76
1910.....	253	41	162	76	1915.....	217	8	37	72
1911.....	265	30	113	81	1916.....	116	4	34	39
1912.....	261	26	100	69	1917.....	141	12	85	35
1913.....	201	15	75	59	1918.....	182	11	60	54

¹ For explanation of exempted institutions, see note 67, below.

² Up to 1912 the Karitane Home, the hospital for infants maintained by the New Zealand Society for the Health of Women and Children, was included in the published returns. In the above figures the infants in this hospital and the deaths among them have been omitted in order to put the series on a uniform basis.

³ The sum of the number on the books at the beginning of the year and the number admitted during the year.

⁴ The average of the number on the books at the beginning and at the end of the year.

⁵ The number on the books at the beginning of the year is assumed equal to the number on the books at the end of the year. For further particulars, see General Table 4, p. 70.

A large proportion of children boarded out apart from their mothers are of illegitimate birth. Table XX gives an idea of the present scope of the New Zealand act in protecting the lives of these children by comparing the illegitimate children brought under the act in a given year with the number of illegitimate births in the same year. An approximate average of from one-sixth to one-fifth of the illegitimate children appears to have been boarded out, and thus come under the provisions of the infant life protection act. As stated previously, between 4 and 5 per cent of all births are illegitimate.

⁶⁷ The minister of education is empowered to grant exemption to institutions supported wholly or in part by the Crown or by public subscription, to relatives of the infant, or to persons as to whom the minister is satisfied the act should not apply. Exempted institutions must be open at all times to persons appointed under the act, and no infant may be removed from the institution without official consent. (Report of the Education Department, "E-4," 1909, p. 37.)

No statistics of mortality among all illegitimate children are available for New Zealand. But in other countries the mortality among the illegitimate is two or often three times as high as that among the legitimate. The New South Wales experience under an infant life protection act similar to that of New Zealand suggests that the infant mortality rate has declined even more among illegitimate than among legitimate infants. In New South Wales a system of infant-life protection has been in force since 1891, with amendments in 1904 and changes in regulations at other times, and the mortality rate among illegitimate infants fell from 276 in the period 1895-1899 to 108 in 1918.

TABLE XX.—Proportion of illegitimate births brought under the infant life protection act, 1908-1918.¹

Year.	Illegitimate births.	Children of illegitimate birth aged 12 months or less brought under the infant life protection act.		Year.	Illegitimate births.	Children of illegitimate birth aged 12 months or less brought under the infant life protection act.	
		Number.	Per cent.			Number.	Per cent.
1908.....	1,105	2 343	31	1914.....	1,302	276	21
1909.....	1,223	2 276	23	1915.....	1,152	250	22
1910.....	1,162	2 211	18	1916.....	1,146	217	19
1911.....	1,078	2 223	21	1917.....	1,158	207	18
1912.....	1,177	249	21	1918.....	1,179	181	15
1913.....	1,180	194	16				

¹ Source: Reports of the Education Department, "E-4," Education; Special Schools, and Juvenile Probation System and Infant-Life Protection, 1909-1919.

² In the source the term "children" is used up to 1911; in 1912 the term "illegitimate children" is introduced, and the same figure is given for 1911 as in the 1911 report for "children."

ROYAL NEW ZEALAND SOCIETY FOR THE HEALTH OF WOMEN AND CHILDREN.

The most important infant-welfare work done by any single agency is that of the Royal New Zealand Society for the Health of Women and Children. This society was organized in Dunedin in 1907 by Dr. Truby King, and was formed to carry on work which he had already commenced for the better care of very young children. The work of this society was described in an early bulletin of the Children's Bureau.⁶⁸

Aims and objects.

The aims and objects of the society are stated in its annual reports as follows:

1. To uphold the sacredness of the body and the duty of health; to inculcate a lofty view of the responsibilities of maternity and the duty of every mother to fit herself for the perfect fulfilment of the natural calls of motherhood,

⁶⁸ New Zealand Society for the Health of Women and Children: An Example of Methods of Baby-Saving Work in Small Towns and Rural Districts. U. S. Children's Bureau Publication No. 6. Washington, 1914.

both before and after childbirth, and especially to advocate and promote the breast feeding of infants.

2. To acquire accurate information and knowledge on matters affecting the health of women and children, and to disseminate such knowledge through the agency of its members, nurses, and others, by means of the natural handing-on from one recipient or beneficiary to another, and the use of such agencies as periodical meetings at members' houses or elsewhere, demonstrations, lectures, correspondence, newspaper articles, pamphlets, books, etc.

3. To train specially, and to employ qualified nurses to be called Plunket nurses, whose duty it will be to give sound, reliable instruction, advice, and assistance, gratis, to any member of the community desiring such services on matters affecting the health and well-being of women, especially during pregnancy and while nursing infants, and on matters affecting the health and well-being of their children; and also to endeavor to educate and help parents and others in a practical way in domestic hygiene in general—all these things being done with a view to conserving the health and strength of the rising generation, and rendering both mother and offspring hardy, healthy, and resistive to disease.

4. To cooperate with any present or future organizations which are working for any of the foregoing or cognate objects.

N. B.—The society was started as a league for mutual helpfulness and mutual education, with a full recognition of the fact that, so far as motherhood and babyhood were concerned, there was as much need for practical reform and "going to school" on the part of the cultured and well-to-do as there was on the part of the so-called poor and ignorant.

Membership.

Any one who subscribes a sum of 5s. (\$1.20) or more a year to the society is a member.

Local committees.

Members of the society living in any locality may join together to establish a branch organization and, with the approval of the central council and the department of health, may establish Plunket rooms and maintain a Plunket nurse. The work of each local branch is supported wholly by local subscriptions and donations, except for a subsidy granted by the health department, and is managed by a local committee of 15 to 20 women elected by the members of the branch. Each branch committee has an advisory board of three or more physicians and business men. The branches contribute to the funds of the central council and send delegates to the general conference of the society which meets annually. Outlying branches in rural communities which can not afford to maintain nurses of their own often secure part-time services of the nurses in near-by cities.

Central organization.

At the general conference questions of policy affecting the work of the society and in particular the relations between the society and the Dominion Government are discussed and decided. The conference also elects a central council, consisting for the most part of Dunedin

members but with representatives from other branches, which conducts the business of the society during the intervals between the meetings of the general conference, including, among other things, the receipt and disbursement to the branch organizations of the subsidies granted by the Government toward the payment of salaries of Plunket nurses. The central committee meets in Dunedin, and the Dunedin members constitute an executive committee.

Except for a paid secretary of the central council and for the nurses, all the work of the society is volunteer.

Training of nurses.

A very important feature of the work of the society is the training of its nurses. The branch at Dunedin, the one which was formed first, maintains a special hospital for the training of all the Plunket nurses employed in the various branches. Two other branches, those at Christchurch and at Wanganui, also maintain special hospitals for babies, but do not train Plunket nurses.

Plunket nurses, as they are called in honor of Lady Plunket, wife of a former Governor of New Zealand, who took great interest in the work of the society, are all registered general or maternity nurses who have had a sort of postgraduate training in infant hygiene, feeding, and mother craft, at the special baby hospital, the Karitane-Harris Hospital, maintained by the society at Dunedin. In this hospital babies are received for dietetic treatment only. Nurses are given careful and thorough instruction in the general methods of care, particularly in the preparation of so-called "humanized" milk—a special kind of modified milk—in clothing, hours of sleep, and other details. The period of training is three months for nurses with general training and six months for nurses with special maternity training only. These nurses pay a fee of £15 (\$73) for their training, which is refunded, however, after two years' service with the society as Plunket nurses. The title "Plunket nurse" is given to nurses only while they are in the employ of the society.

Besides the Plunket nurses, the society trains Karitane nurses. These are women without previous nursing training who have taken a course of 12 months at one of the Karitane hospitals and have passed a satisfactory examination. The fee for this course is £20 (\$97.32). The Karitane nurses are trained to serve as nursemaids for babies or children; in a few instances during the war emergency a Karitane nurse acted as assistant to a Plunket nurse, but training as general or maternity nurses is a prerequisite to becoming Plunket nurses. Karitane nurses are trained not only at the Karitane-Harris Hospital at Dunedin but also at the Karitane Hospitals maintained by the branches at Christchurch and at Wanganui.

In this connection it is of interest to note that Dr. Margaret Harper, a physician sent in 1920 by the Society for the Welfare

of Mothers and Babies of New South Wales to study the work of the Plunket Society, commented very favorably upon the thorough training given to nurses. In her report to the New South Wales Society she says:

The training of the nurses in the handling of babies in general infant hygiene and what is known as mother craft is excellent. No detail is too small to be observed, and no trouble is too great to be taken in the training and feeding of the baby.⁶⁹

Kinds of work.

The principal line of work followed is maintenance of infant-welfare or baby-health centers, at which the specially trained Plunket nurses give free advice on all matters relating to the care of babies except purely medical matters. The nurses do not give treatment or medicines of any kind for diseased or sick infants, but advise the mothers to call the family doctor.

The mothers bring their babies to the centers for advice in regard to diet and care; from the centers the nurses also make visits to the homes. An important feature of the work is the general instruction given in regard to proper clothing, fresh air, and hours of sleep.

The policy of the society is everywhere to encourage breast feeding, but if that is not possible "humanized" milk is recommended and demonstrations as to the method of preparing it are given.⁷⁰ No nurse is allowed, however, to suggest weaning a baby without the advice of a physician; on the contrary, they are instructed to encourage the mothers to continue breast feeding.

Mothers in all communities where Plunket nurses are stationed have, therefore, free for the asking, trained and skilled assistance in regard to all matters relating to the health and welfare of their babies, with the sole exception of medical attention in case of sickness. They have also a very important aid in the nurses' advice as to when a physician should be summoned.

Mothers in other communities often ask questions by mail, and answering these inquiries is part of the work of the Plunket nurses. It is worthy of mention that inquiries have been received from mothers as far away as Australia who had heard of the work of the Plunket nurses.

⁶⁹ Harper, Dr. Margaret: Report on the Work of the Royal New Zealand Society for the Health of Women and Children, p. 6. (Extracts from this report are given in Appendix A, pp. 57-62.)

⁷⁰ According to the method in vogue in New Zealand, "humanized" milk is prepared in the following way: Whole cow's milk is allowed to set for from four to six hours, then the top is drawn off and mixed with the proper proportions of water, sugar of milk, and other ingredients. For very young infants whey may be substituted for water in the formula. The formula and the amount prescribed vary with the individual case. The term "humanized" is merely a popular variant of "modified."

The mothers are encouraged to come to the Plunket nurses before confinement, but as yet the amount of prenatal work is not large. During 1919, only 859 new cases were reported of mothers coming for advice before the birth.⁷¹

Besides the individual work with mothers and babies, the society supplies a column called "Our Babies," which is printed weekly in many of the newspapers in New Zealand. As an example of the kind of articles published Dr. Harper mentions the reprinting of a lecture by Dr. Emmett Holt, of New York, to health officers, dealing with health teaching in the schools.

The society also distributes, at nominal cost, booklets and pamphlets in regard to the care of infants. These pamphlets include *The Expectant Mother and Baby's First Month*, *Feeding and Care of Baby*, *Natural Feeding of Infants*, *The Story of the Teeth and How to Save Them*, and others. One of these pamphlets, *The Expectant Mother and Baby's First Month*, has been taken over and published by the health department, and is distributed free of cost to mothers on the registration of the births of their babies.

A feature of the work is that all apparatus and methods used, not only in the baby-health centers but also in the baby hospitals, are so simple that any mother can secure and apply them in her own home.

It should be emphasized that the society does not confine its work simply to the children of the poorer classes but, on the contrary, urges mothers in all classes to use the services of the Plunket nurses. The work of the society is, therefore, well known and appreciated among the well-to-do—"the upper classes"—and the desire to imitate these classes becomes an influence in spreading the use of its facilities among those not so well off. It also helps in removing any feeling that the work of the society is on a charitable basis.

In this connection it may be in place to quote from Dr. Harper's report⁷² already mentioned:

The conclusions which I have come to are as follows:

1. That the success of the New Zealand society lies chiefly in the popularizing the breast feeding of babies.

An atmosphere has been created in which a mother is almost ashamed to have to admit that her baby is not naturally fed.

2. That this end has been attained—

- (a) By the careful and detailed training (given as a postgraduate course) of nurses in so-called mother craft, and especially in the dealing with difficulties of breast feeding; and by the establishment of the Plunket centers from which these nurses work.

⁷¹ Figures furnished through the courtesy of the health department of New Zealand. The number of live births in 1919 was 24,483, hence only about 3.5 per cent of the mothers confined in 1919 received prenatal advice from the Royal New Zealand Society for the Health of Women and Children.

⁷² Harper, Dr. Margaret: Report on the Work of the Royal New Zealand Society for the Health of Women and Children, p. 11. Issued by the Royal Society for the Welfare of Mothers and Babies of N. S. W. Sydney, 1920.

(b) By the educating of the public, by means of pamphlets, by the publication of the weekly column called "Our Babies" in the press. The public-health department publishes and distributes free of charge the society's pamphlet, "The Expectant Mother and Baby's First Month." In this way the same standards and ideas are circulated through the whole of New Zealand.

(c) By the education of the members of the committees, and the spreading of the knowledge thus obtained through all classes of the community.

(d) By the special training given in Dunedin to the medical students by Dr. Williams, the lecturer in pediatrics at the medical school, who is also one of the honorary medical officers in charge of the Karitane-Harris Hospital.

The students are encouraged to go to the Karitane-Harris Hospital, and there come into direct contact with the practical side of the work.

Extent of work.

In regard to the growth and extent of the work of the society, very little statistical information is available. The society has published annual reports, but the statistics presented are somewhat fragmentary.

Branches were organized in 1907 and 1908 in the four principal cities. The number of main branches maintaining Plunket nurses has gradually increased until in March, 1920, it was 30; in addition there were 45 subbranches in outlying districts, and local committees had been formed in a number of other smaller places. The number of Plunket nurses gradually increased to 28 in 1916, and to 46 in 1920.

In the year ended March 31, 1919, the total number of babies cared for was 15,951, a figure which increased to 19,142 in 1920. This figure, however, includes not only infants brought for the first time under the care of the society but also infants brought in at any time during the year who had been under care in a previous year. Babies are usually first brought under care before they are 1 year old, and very rarely after passing the first birthday; but after having formed the habit of consulting the Plunket nurses mothers frequently bring their babies, as they are urged to do, at intervals until the children reach 2 years of age.

The number of infants brought under care for the first time may fairly be compared to the number of births to show roughly the proportion of infants born in New Zealand who are brought directly under the influence of the Plunket nurses. The figure for 1919, furnished through the courtesy of the health department, to which the society makes monthly reports, was 6,454; when compared with the total number of births for that year, this gives 26.4 per cent. or over one-fourth of all the New Zealand babies, cared for by the society. The proportion was much higher in the cities in which most of the work was centered. But even outside the four principal cities over one-sixth of all births in 1919 came directly under the care of the Plunket Society, as shown in Table XXI.

It should be pointed out that the infants who are brought directly under the supervision of the Plunket nurses—about one-fourth of the infants born—probably include the great majority of those most in need of such care; furthermore, a large proportion of the remainder are doubtless reached by the educational measures of the society and by the distribution of pamphlets.

TABLE XXI.—*Proportion of infants brought directly under care of the Plunket Society, 1919.*

Place.	Births, 1919. ¹	Infants brought under care for first time during 1919.	
		Num- ber. ²	Per cent of births.
New Zealand.....	24,483	6,454	26.4
Four chief cities (metropolitan areas).....	7,683	3,337	43.4
Remainder of Dominion.....	16,800	3,117	18.6

¹ Statistics of the Dominion of New Zealand, 1919, Vol. I, Population and Vital Statistics, pp. 33 and 85.

² From manuscript table furnished by courtesy of the Department of Health of New Zealand.

CONCLUSION.

It remains to point out the relationship between the general health movements and the specific measures of governmental and private agencies, and the reduction of the infant mortality from the several causes.

Certain influences have been operating steadily toward a decrease in infant mortality throughout the period. These influences include the gradual increase in medical knowledge of the best methods of disease prevention, the raising of the level of training in the medical profession, the improvements in public sanitation, the gradual extension of the public-health work in the Dominion as shown in the increase of powers and the improvements in methods of administration in the health department, and the gradual education of the public in methods of preventing disease and of maintaining health. These movements are difficult to trace in their individual effects upon infant mortality, but their combined influence is written plainly in the gradual and steady improvement in the rates of infant mortality from epidemic diseases and tuberculosis, as well as in the decline in infant mortality from respiratory and from gastric and intestinal diseases which occurred during the period from about 1875 to 1905.

The marked acceleration in the rate of decline in infant mortality beginning about 1905 points clearly to the presence of new causes operating to produce it. The study of the work of various governmental and private agencies, so far as they affected infant welfare

during the period under review, suggests three principal movements as responsible in the main for this acceleration.

The establishment of State maternity hospitals for the training of maternity nurses was a very important beginning in a gradual raising of the level of maternity care available. The compulsory registration of midwives and the voluntary registration of nurses were further steps toward securing better maternity and general nursing service.

The work of the St. Helen's Hospitals, although especially directed toward providing for better confinement care for the wives of workmen, offers large possibilities for the reduction of the infant mortality rate from causes peculiar to early infancy—causes which are related to the care and condition of the mother. The decrease of one-half in the infant mortality rate during the first month of life secured in New York City by systematic prenatal supervision shows in a striking way what can be accomplished in the further reduction of the rate from causes peculiar to early infancy.⁷³ As yet, the St. Helen's Hospitals provide nursing and confinement services for the mothers of only about one-sixteenth of the infants born in New Zealand, and have paid comparatively little attention to the need for prenatal care. Nevertheless, their work already appears to have had a slight influence on the mortality from causes peculiar to early infancy.

The work of infant-life protection is another important factor in the reduction of infant mortality. This work reaches only infants boarded out apart from their mothers; this group, for the most part of illegitimate birth, is one in which infant mortality is generally high, and is therefore in especial need of supervision. Since the improvement of the inspection service due to the employment of trained inspectors for infants' homes, the reduction in mortality among these infants has been marked.

The most important influence in the reduction of the infant mortality rate is undoubtedly the work of the Royal New Zealand Society for the Health of Women and Children. Organized in 1907 in Dunedin, its work spread to other cities and has gradually enlarged until in 1919 it reached directly through its infant-welfare centers over one-fourth of all the babies born in New Zealand. Through its newspaper health articles and through its distribution of pamphlets, including the distribution of its principal pamphlet through the department of health upon the registration of births, the society also undoubtedly exerts an important influence over a large proportion of those infants not directly reached by the Plunket nurses.

⁷³ Baker, S. Josephine, M. D., and Sobel, Jacob, M. D.: "Control of infant morbidity and mortality in New York City," in *Monthly Bulletin of the Department of Health, City of New York*, Vol. XI (October, 1921), p. 233.

The emphasis laid upon breast feeding and, in case breast feeding is not possible, upon "humanized milk," makes for a reduction in the mortality from gastric and intestinal diseases, while general instruction in infant hygiene, the value of fresh air, proper clothing, and other matters, doubtless exerts an important influence in reducing the mortality from respiratory diseases.

These new movements, together with the conditions favorable to low infant mortality rates already described, are doubtless responsible for New Zealand's position as the country with the lowest infant mortality rate.

APPENDIXES

**This page is blank in the
original document.**

APPENDIXES.

APPENDIX A.—EXTRACTS FROM "REPORT ON THE WORK OF THE ROYAL NEW ZEALAND SOCIETY FOR THE HEALTH OF WOMEN AND CHILDREN,"¹ BY DR. MARGARET HARPER.

The Karitane-Harris Hospital consists of a cottage situated in one of the suburbs of Dunedin. The site is a beautiful one overlooking the harbor; the grounds are large, with flower gardens, trees, and lawns, and all the appointments are of the simplest. The babies are accommodated in basket cradles, placed on a platform running round the walls of the room. These cradles are light, and easily carried to the verandas, or on to the lawns. Wherever the cots are placed, inside or out, a distance of $3\frac{1}{2}$ feet is maintained between them. This is done with the object of preventing any chance of respiratory or other infection from being carried from one baby to the other.

There is an isolation room to be used if necessary, and a room where premature babies can be cared for. This latter is heated by steam pipes, and can be kept at a uniform temperature, with a suitable supply of fresh air. No incubators are used. The premature baby is fed and cared for entirely in this room. If the baby is too small and weak to suck, the mother is instructed in the art of expressing the milk, which is then given to the baby in the way best suited to its condition. This expression of the milk by the mother herself is used in all cases where it is necessary to draw off the milk. The breast pump is never used, as anyone who has had experience knows it is difficult, I would almost say impossible, to increase or even keep up the supply of breast milk by means of the breast pump.

By using the proper manipulations it is possible to increase the supply of milk, almost as if the breasts were being naturally stimulated by the baby.

In one case the 24-hours supply was increased from $17\frac{1}{2}$ ounces to $30\frac{1}{2}$. In another case it was increased from $8\frac{1}{2}$ ounces to $26\frac{1}{2}$.

The nursery is the room where the baby is taken to be washed, dressed, and weighed. Each baby has its own separate basket of cloths, etc. A kicking pen is used in order to give the babies freedom for awhile to exercise their limbs.

There is a milk room, where the food for each baby for 24 hours is prepared, put into bottles, and kept cool until required.

One nurse deals with this under the supervision of the matron or sister. Each nurse has two weeks' training in this department.

The babies who are admitted are the premature, those suffering from malnutrition due to want of care, and to errors in feeding. None are admitted with acute disease, although, as there is no children's hospital, cases of pyloric obstruction, which are suitable for dietetic treatment, have been admitted. If operation is necessary, they are transferred to the general hospital.

No tuberculous, syphilitic, or mentally deficient baby is admitted.

¹ Issued by the Royal Society for the Welfare of Mothers and Babies of N. S. W. Sydney, 1920.

The average number of babies in hospital is 12 (3 of these with their mothers), and the number of nurses 15. The eight-hour system is in vogue in New Zealand, so that 15 nurses are not too many to give the individual attention necessary to each baby.

As soon as the baby is gaining regularly in weight, it is discharged to its home and passes into the care of the local Plunket nurse. The average stay of the baby in the hospital is a fortnight.

The short stay in hospital, the large number of nurses, and the cool climate lessen the risks which are always associated with institutions in which babies are admitted without their mothers.

The mothers' cottage is situated in the grounds at a little distance from the hospital. It consists of three bedrooms, a sitting room, and bathroom. Each bedroom has a bright and cheerful outlook, and there is a good veranda on three sides of the cottage.

Here mothers, who are having difficulty with breast feeding, are accommodated, and to my mind this is the most interesting and valuable part of the work.

* * * * *

Here the mother is relieved from all household worries and is free to rest. The average time for a mother's stay is a fortnight.

Sometimes mothers who are unable to leave their families come in for the week end when their husbands are at home. Even this short stay is beneficial in setting the mother on right lines.

* * * * *

The training of the nurses in the handling of babies in general infant hygiene and what is known as mother craft is excellent. No detail is too small to be observed, and no trouble is too great to be taken in the training and feeding of the baby.

No artificial food is used except cow's milk modified to suit the requirements of each baby.

The nurses are thoroughly trained in this one method of artificial feeding. They are taught to think of the milk mixtures in terms of the percentages of the sugar, fat, and protein present, and to reckon the quantity required in calories.

They are taught the requirements of the normal baby, the average weights of babies of various ages, and from the weight of the child they calculate the number of calories required. If the baby is underweight and undernourished, the amount required will be less than for a normal baby of that age. As the baby improves and increases in weight, the amount of food required approaches more closely to the normal for that age.

Thus the nurse has a standard to which, if the baby is badly nourished, she must try to raise it. If it is overnourished and overfed, she can reduce its food to the proper quantity.

The quality of the food is reckoned in the percentages of sugar, fat, and protein present, the quantity by the number of calories.

The advantages of the method are:

1. That having the standard of mother's milk we can modify animal milk, either fresh cow's milk, dried milks, or condensed milk, so that they approach in composition the baby's natural food.
2. That the nurses are in a position to teach mothers to feed their babies by their weights, so that the dangers of underfeeding and overfeeding may both be avoided.

Intervals between the feeds are three hours, or in some cases four hours, from the beginning. The last feed is given at 10 p. m., the first at 6 a. m.

If the baby wakes during the night it is made comfortable, turned in the bed, and given a drink of boiled water if necessary. Very soon the baby gets into the way of sleeping all night. Few babies will wake for a drink of plain water.

BREAST FEEDING.

The fundamental lesson, however, which is impressed continually on the nurse in training is the absolute superiority of mother's milk for the baby over every kind of artificial food, and that every mother can feed her baby, if not entirely, for seven or eight months, at least, partially.

Each nurse during her training has entire charge of mother and baby in cases where some difficulty has arisen in the breast feeding. In this way the nurse knows of her own experience the difficulties which may arise, and learns that they can be overcome, and how to overcome them. When her training is finished she has confidence not only in her own ability to help mothers but in the mother's ability to nurse the baby if only she is put on the right lines. It is no matter of hearsay or theory; it is a matter of personal knowledge: "her eyes have seen and her hands handled," so that the nurse herself knows, and this is the first essential for convincing others.

* * * * *

The training is simple. Every detail is considered and ordinary common-sense methods applied.

1. The mother is taught the ordinary laws of infant hygiene; that the baby must have fresh air, exercise, not too many clothes, that it must sleep in its own bed, have regular bathing, that care must be taken of its skin, and so on. So that, to begin with, the baby is comfortable and healthy, with a healthy appetite. The baby is trained from the beginning to regular hours of feeding and of sleep. The intervals between the feeds are either three hours, to be soon lengthened to four, or in some cases four hours from the beginning. Whether three or four hourly intervals are the rule during the day, the long interval at night—from 10 p. m. to 6 a. m.—is insisted on.

By these means the mother gets an unbroken night's sleep and more freedom during the day, and thus the nervous strain of domestic life is lessened and the mother is more able to nourish her baby.

Once a mother has fed a baby with these longer intervals between the feeds, she will never return to the older methods.

The baby is happy and comfortable, and when his meal time arrives he is hungry and ready for his food. In this way the supply of milk is encouraged. With regard to the mother herself—the diet, daily life, and exercise are regulated.

DIET.

Three good meals a day, with plenty of vegetables and fresh fruit. Any plainly cooked, good food is allowed, with a certain amount of milk, but not too large a quantity.

Plenty of fluid, best taken in the form of cold water between meals. In some cases, in order to make sure of the mother's taking a sufficiency of water, it is recommended to take a tumblerful before each time the baby is fed.

EXERCISE.

Plenty of exercise. Some part of which must be taken in the open air every day in the form of walking.

92832°—22—5

LOCAL MEASURES.

If the milk supply is not satisfactory, local stimulation is given in the form of massage and sponging.

The massage is given 10 minutes to each breast twice daily. The massage movements are from the surrounding parts toward the breast tissue, the idea being to increase the supply of blood carrying the nutrient material to the breast.

Sponging is done with the same object. After the massage the sponging is done by the mother. She has a basin of hot and a basin of cold water, and gives each breast $2\frac{1}{2}$ minutes by the clock of hot, then $2\frac{1}{2}$ minutes cold, sponging—10 minutes each breast.

These measures are only necessary in cases where the supply of milk has gone off, and where the desire is to increase the quantity. In ordinary normal cases, of course, such measures are not necessary. When they are used it is only for a short time until the supply is established again.

All that is necessary in the case of a healthy mother who is prepared before the birth of her child to nurse it is:

1. Regular stimulation of the breast at proper intervals by the baby.
2. Regular exercise and fresh air.
3. Nights of unbroken rest.
4. Good plain food. No overfeeding.
5. Plenty of fluid in the form of water between meals.
6. A good, happy baby that sleeps well, and is not fretful.

The aim of this training is to establish what one may call a "virtuous circle." A mother who trains her baby to good habits, regular hours of sleep and feeding, with its natural food, produces a good, happy, healthy baby, who sleeps well and is not fretful, and in its turn produces a calm and happy mother, who is able to give her baby its natural food even in these days of domestic difficulties.

* * * * *

In Dunedin, in connection with the society, there is a milk-modifying depot. It consists of a room in the distributing depot of one of the principal dairying companies.

The milk is received unpasteurized about 10 a. m. There are two women attendants who receive it and Pasteurize it. Then it is passed over a cooling apparatus, then modified according to prescriptions for each child, and the 24-hour supply is bottled.

It is then sent down to the dairy cooling chamber and kept there until next morning, when the 24-hour supply is sent out on the ordinary milk cart, with no cooling arrangements, and exposed to whatever heat there is in Dunedin. Hence the last of the baby's feeds is at least 48 hours old. There has been trouble with this milk, I was told, and certainly such a method would not answer in Sydney, where the heat is so much greater, and many people have no means of cooling down the milk, warmed up in the delivery carts. If it could be delivered cold—by simple devices it could be kept cold—but even in this way too many loopholes for disaster are left.

As far as I could learn the milk supply of the towns in New Zealand was not good. There is only one delivery in the day, and the milk that comes in at 10 a. m. is not distributed until the next morning. In Auckland the Plunket nurses told me that by going direct to the depot at 10 a. m., the mothers, on the nurses' recommendation, could obtain the fresh milk. But, of course, this was of very limited use, as few mothers have time to go any distance for their milk.

* * * * *

The conclusions which I have come to are as follows:

1. That the success of the New Zealand society lies chiefly in the popularizing the breast feeding of babies.

An atmosphere has been created in which a mother is almost ashamed to have to admit that her baby is not naturally fed.

2. That this end has been attained—

- (a) By the careful and detailed training (given as a post graduate course) of nurses, in so-called mother craft, and especially in the dealing with difficulties of breast feeding; and by the establishment of the Plunket centers from which these nurses work.
- (b) By the educating of the public, by means of pamphlets, by the publication of the weekly column called "Our Babies" in the press. The public health department publishes and distributes free of charge the society's pamphlet entitled "The Expectant Mother and Baby's First Month." In this way the same standards and ideas are circulated through the whole of New Zealand.
- (c) By the education of the members of the committees, and the spreading of the knowledge thus obtained through all classes of the community.
- (d) By the special training given in Dunedin to the medical students, by Dr. Williams, the lecturer in pediatrics at the Medical School, who is also one of the honorary medical officers in charge of the Karitane-Harris Hospital.

The students are encouraged to go to the Karitane-Harris Hospital, and there come into direct contact with the practical side of the work.

Among other things, Dr. Harper recommended for New South Wales:

The establishment of a training school for nurses on lines somewhat similar to those on which the Karitane-Harris Hospital is carried on.

The course of training should be a postgraduate one, given only to nurses with midwifery or general nursing certificates. Later the question of training women as Karitane nurses may be considered, but in the meantime we should give all our attention to giving nurses the special training.

In view of the fact that the experience of those physicians in Sydney who are best qualified to judge is that hospitals which admit babies without their mothers sooner or later are visited by epidemics of gastroenteritis, I should recommend that only babies with their mothers should be admitted to this institution. This arrangement would allow the nurses to get sufficient experience in dealing with artificial food, as nearly all the cases where mothers are having difficulty with breast feeding the baby must have, at least temporarily, supplementary feeds of artificial food. The hospital should be as home-like as possible, with plenty of ground round it, so that the babies and mothers may have the benefit of fresh air and open space. The matron and sister should be nurses who are thoroughly conversant with the methods of training in use at Dunedin. To begin with, the baby clinic nurses should be given the benefit of the special training. These nurses come from the various training schools in different parts of Australia, and in not one case have they had any training in dealing with babies. If they come from a children's hospital they know how to deal with sick babies, but of infant hygiene in general they know very little. For long I have felt that unless our nurses have some special training in "mother craft" much of their work is ineffective, and I may add that many of the nurses doing the clinic work at present feel the same.

Arrangements should be made so that the nurses at present doing the clinic work should be relieved in rotation, in order to go through the course of training.

A rule should then be made that no nurse would be eligible for appointment to a baby clinic who has not been through the special course in mother craft.

Later, when the clinic nurses have had their training (possibly at the same time, as only a limited number of clinic nurses can be freed at a time), midwifery and generally trained nurses should be encouraged to go through the course.

When the training school has been established, and there is some prospect of having a supply of qualified nurses, the advisability of forming committees of women in suburbs which the baby clinics will not reach might be considered. These committees could then employ nurses for their respective districts.

APPENDIX B—REGULATIONS REGARDING STORAGE AND SALE
OF MILK.

The regulations for the storing and sale of milk in force in 1919 were as follows.²

16. FOR SECURING CLEANLINESS AND FREEDOM FROM CONTAMINATION OF MILK.

(1) Every person who sells milk shall at all times keep clean every place in which such milk is sold, and all furniture, fittings, apparatus, and vehicles used in connection with the sale of milk.

(2) No person shall apply to his mouth any vessel or utensil which contains or which comes in contact with any milk for sale.

(3) Every person who sells milk shall, so far as is practicable, protect such milk from dirt and dust, and from contamination by flies or any animal.

(4) No person shall keep, measure, carry, or deliver any milk for sale, or cause or suffer any such milk to be kept, measured, carried, or delivered in any vessel which is not clean.

(5) No person shall use any vessel with rough or broken or rusty edges or surface for containing, measuring, or carrying any milk for sale.

(6) No person shall use for containing, storing, or conveying milk for sale any vessel unless it is so constructed as to permit of every part of the interior of the vessel being seen and adequately cleansed, nor unless it is provided with a lid or covering which shall protect the interior from dust, or rain, or contamination by flies or any animal.

(7) No person shall sell milk in any place in which is stored, kept, or sold any kerosene, vegetables, fish, meat (except vegetables, fish, and meat in hermetically sealed packages), or any other substance by which milk is or is liable to be contaminated; nor in any room which is used as a living room or kitchen, or as a sleeping room, or which opens directly off any sleeping room; nor in any room which is in direct communication with or is liable to contamination from any water-closet, pan closet, pit privy, urinal, stable, or pigsty, or which has in it any opening into any drain or sewer.

(8) No person shall milk any cow or cause or suffer any cow under his control to be milked for the purpose of obtaining milk for sale—

(a) Unless at the time of milking the udder and teats of the cow are clean;

(b) Unless the hands of the person milking such cow are clean and free from all contamination or infection.

(9) No person shall use or cause or suffer to be used for closing or for helping to close any churn, tin, or other vessel containing milk for sale, any rag or canvas, or any material which is liable to contaminate milk.

(10) Every person who receives or delivers milk for retail sale shall, as soon as possible after emptying, cleanse or cause to be cleansed every part of any vessel within his control in which such milk has been carried.

(11) Every person who sells milk shall provide, for the purpose of cleansing all vessels and apparatus under his control which come in contact with the milk, a suitable and sufficient supply of cold and of boiling water.

² Regulations under the sale of food and drugs act, 1908, of Mar. 4, 1913 (published in the New Zealand Gazette, Mar. 6, 1913, p. 758ff.), pp. 34-35.

**This page is blank in the
original document.**

GENERAL TABLES

**This page is blank in the
original document.**

GENERAL TABLES.

GENERAL TABLE 1.—*Births, infant deaths, and infant mortality rates, by cause of death, New Zealand, 1872-1919.*¹

Year.	Live births.	Deaths under 1 year of age.									
		Total (1-189).		Epidemic diseases (1-19).		Tuberculosis (28-35).		Venereal diseases (37, 38).		Encephalitis, meningitis, and infantile paralysis (60, 61, part 63).	
		Num-ber.	Rate per 1,000 births.	Num-ber.	Rate per 1,000 births.	Num-ber.	Rate per 1,000 births.	Num-ber.	Rate per 1,000 births.	Num-ber.	Rate per 1,000 births.
1872.....	10,795	1,084	100.4	111	10.3	55	5.1	2	0.2	27	2.5
1873.....	11,222	1,213	108.1	280	25.0	47	4.2	3	.3	20	1.8
1874.....	12,844	1,394	108.5	121	9.4	62	4.8	3	.2	14	1.1
1875.....	14,438	1,816	125.8	101	7.0	104	7.2	5	.3	23	1.6
1876.....	16,168	1,673	103.5	109	6.7	96	5.9	5	.3	30	1.9
1877.....	16,856	1,527	90.6	156	9.3	93	5.5	8	.5	26	1.5
1878.....	17,770	1,500	84.4	149	8.4	83	4.7	7	.4	24	1.4
1879.....	18,070	1,941	107.4	219	12.1	97	5.4	3	.2	30	1.7
1880.....	19,341	1,805	93.3	100	5.2	96	5.0	8	.4	27	1.4
1881.....	18,732	1,731	92.4	154	8.2	101	5.4	5	.3	36	1.9
1882.....	19,009	1,678	88.3	147	7.7	94	4.9	6	.3	19	1.0
1883.....	19,202	1,995	103.9	216	11.2	100	5.2	7	.4	28	1.4
1884.....	19,846	1,573	79.3	145	7.3	94	4.7	4	.2	14	.7
1885.....	19,693	1,756	89.2	121	6.1	77	3.9	7	.4	23	1.2
1886.....	19,299	1,899	98.4	160	8.3	95	4.9	5	.3	31	1.6
1887.....	19,135	1,795	93.8	158	8.3	102	5.3	12	.6	30	1.6
1888.....	18,902	1,336	70.7	101	5.3	80	4.2	5	.3	24	1.3
1889.....	18,457	1,456	78.9	69	3.7	48	2.6	7	.4	17	.9
1890.....	18,278	1,438	78.7	125	6.8	47	2.6	4	.2	32	1.8
1891.....	18,273	1,667	91.2	240	13.1	66	3.6	8	.4	29	1.6
1892.....	17,876	1,594	89.2	132	7.4	65	3.6	6	.3	25	1.4
1893.....	18,187	1,600	88.0	229	12.6	60	3.3	12	.7	20	1.1
1894.....	18,528	1,507	81.3	193	10.4	59	3.2	13	.7	14	.8
1895.....	18,546	1,637	88.3	168	9.1	65	3.5	12	.6	16	.9
1896.....	18,612	1,439	77.3	70	3.8	52	2.8	10	.5	29	1.6
1897.....	18,737	1,354	72.3	57	3.0	51	2.7	9	.5	18	1.0
1898.....	18,955	1,510	79.7	82	4.3	52	2.7	13	.7	30	1.6
1899.....	18,835	1,806	95.9	160	8.5	66	3.5	12	.6	22	1.2
1900.....	19,546	1,469	75.2	105	5.4	35	1.8	11	.6	23	1.2
1901.....	20,491	1,463	71.4	58	2.8	48	2.3	11	.5	28	1.4
1902.....	20,655	1,712	82.9	123	6.0	37	1.8	11	.5	23	1.1
1903.....	21,829	1,770	81.1	205	9.4	46	2.1	7	.3	21	1.0
1904.....	22,766	1,616	71.0	60	2.6	28	1.2	14	.6	31	1.4
1905.....	23,682	1,599	67.5	37	1.6	29	1.2	17	.7	32	1.4
1906.....	24,252	1,506	62.1	53	2.2	32	1.3	10	.4	19	.8
1907.....	25,094	2,228	88.8	284	11.3	47	1.9	12	.5	29	1.2
1908.....	25,940	1,761	67.9	53	2.0	40	1.5	11	.4	44	1.7
1909.....	26,524	1,634	61.6	59	2.2	33	1.2	7	.3	39	1.5
1910.....	25,984	1,760	67.7	127	4.9	37	1.4	16	.6	45	1.7
1911.....	26,354	1,484	56.3	30	1.1	17	.6	11	.4	44	1.7
1912.....	27,508	1,409	51.2	26	.9	29	1.1	8	.3	32	1.2
1913.....	27,935	1,653	59.2	75	2.7	20	.7	10	.4	39	1.4
1914.....	28,338	1,456	51.4	70	2.5	16	.6	12	.4	28	1.0
1915.....	27,850	1,394	50.1	76	2.7	10	.4	8	.3	29	1.0
1916.....	28,509	1,446	50.7	93	3.3	12	.4	10	.4	35	1.2
1917.....	28,239	1,360	48.2	55	1.9	8	.3	11	.4	30	1.1
1918.....	25,860	1,252	48.4	96	3.7	15	.6	10	.4	34	1.3
1919.....	24,483	1,108	45.3	20	.8	11	.4	8	.3	21	.9

¹ Source: Manuscript table furnished by courtesy of Mr. J. W. Butcher, acting Government statistician. The figures under the causes of death refer to the International List numbers included in each group.

INFANT MORTALITY.

GENERAL TABLE 1.—Births, infant deaths, and infant mortality rates, by cause of death, New Zealand, 1872-1919—Continued.

Year.	Live births.	Deaths under 1 year of age.							
		Infantile convulsions (71).		Respiratory diseases (86-98).		Gastric and intestinal diseases (102-110).		Malformations (150).	
		Number.	Rate per 1,000 births.	Number.	Rate per 1,000 births.	Number.	Rate per 1,000 births.	Number.	Rate per 1,000 births.
1872	10,795	116	10.7	117	10.8	262	24.3	6	0.6
1873	11,222	111	9.9	142	12.7	176	15.7	9	.8
1874	12,844	122	9.5	178	13.9	371	28.9	7	.5
1875	14,438	154	10.7	251	17.4	381	26.4	20	1.4
1876	16,168	125	7.7	180	9.9	416	25.7	42	2.6
1877	16,856	122	7.2	170	10.1	317	18.8	26	1.5
1878	17,770	132	7.4	159	8.9	326	18.3	16	.9
1879	18,070	144	8.0	287	15.9	414	22.9	23	1.3
1880	19,341	148	7.7	263	13.6	385	19.9	31	1.6
1881	18,732	140	7.5	245	13.1	356	19.0	26	1.4
1882	19,009	157	8.3	217	11.4	290	15.3	26	1.4
1883	19,202	159	8.3	245	12.8	476	24.8	19	1.0
1884	19,846	159	8.0	201	10.1	226	11.4	28	1.4
1885	19,693	133	6.8	234	11.9	390	19.8	18	.9
1886	19,299	159	8.2	241	12.5	407	24.2	23	1.2
1887	19,135	127	6.6	190	9.9	407	24.4	26	1.4
1888	18,902	116	6.1	178	9.4	225	11.9	25	1.3
1889	18,457	106	5.7	192	10.4	357	19.3	24	1.3
1890	18,278	113	6.2	174	9.5	340	18.6	25	1.4
1891	18,273	122	6.7	244	13.4	337	18.4	20	1.1
1892	17,876	116	6.5	190	10.6	386	21.6	16	.9
1893	18,187	122	6.7	260	14.3	235	12.9	29	1.6
1894	18,528	106	5.7	165	8.9	249	13.4	19	1.0
1895	18,546	136	7.3	278	15.0	286	15.4	38	2.0
1896	18,612	128	6.8	115	6.2	366	19.7	29	1.6
1897	18,737	108	5.8	182	9.7	320	17.1	30	1.6
1898	18,955	100	5.3	142	7.5	369	19.5	28	1.5
1899	18,835	129	6.8	260	13.8	388	20.6	24	1.3
1900	19,546	106	5.4	157	8.0	321	16.4	30	1.5
1901	20,491	91	4.4	226	11.0	256	12.5	34	1.7
1902	20,655	82	4.0	251	12.2	358	17.3	34	1.6
1903	21,829	103	4.7	251	11.5	336	15.4	35	1.6
1904	22,766	95	4.2	164	7.2	414	18.2	31	1.4
1905	23,682	96	4.1	236	10.0	337	14.2	21	.9
1906	24,252	90	3.7	181	7.5	278	11.5	27	1.1
1907	25,094	84	3.3	286	11.4	572	22.8	32	1.3
1908	25,940	76	2.9	155	6.0	461	17.8	41	1.6
1909	26,524	107	4.0	190	7.2	301	11.3	59	2.2
1910	25,984	80	3.1	178	6.9	390	15.0	58	2.2
1911	26,354	89	3.4	175	6.6	283	10.7	51	1.9
1912	27,508	51	1.9	140	5.1	216	7.9	117	4.3
1913	27,935	71	2.5	173	6.2	251	9.0	89	3.2
1914	28,338	51	1.8	126	4.4	213	7.5	98	3.5
1915	27,850	55	2.0	144	5.2	151	5.4	132	4.7
1916	28,509	74	2.6	134	4.7	209	7.3	108	3.8
1917	28,239	56	2.0	115	4.1	176	6.2	120	4.2
1918	25,860	53	2.0	112	4.3	82	3.2	82	3.2
1919	24,483	47	1.9	107	4.4	101	4.1	112	4.6

GENERAL TABLE 1.—*Births, infant deaths, and infant mortality rates, by cause of death, New Zealand, 1872-1919—Continued.*

Year.	Live births.	Deaths under 1 year of age.							
		Early infancy (151-153).		External diseases (155-186).		Other defined diseases (—).		Diseases unknown or ill defined (187-189).	
		Number.	Rate per 1,000 births.	Number.	Rate per 1,000 births.	Number.	Rate per 1,000 births.	Number.	Rate per 1,000 births.
1872.....	10,795	264	24.5	13	1.2	81	7.5	30	2.8
1873.....	11,222	256	22.8	16	1.4	123	11.0	30	2.7
1874.....	12,844	304	23.7	22	1.7	170	13.2	20	1.6
1875.....	14,438	423	29.3	31	2.1	295	20.4	28	1.9
1876.....	16,168	399	24.8	23	1.4	237	14.7	31	1.9
1877.....	16,856	359	21.3	36	2.1	199	11.8	15	.9
1878.....	17,770	373	21.0	38	2.1	181	10.2	12	.7
1879.....	18,070	443	24.5	36	2.0	228	12.6	17	.9
1880.....	19,341	414	21.4	40	2.1	275	14.2	18	.9
1881.....	18,732	398	21.2	36	1.9	231	12.3	3	.2
1882.....	19,009	473	24.9	34	1.8	212	11.3	3	.2
1883.....	19,202	435	22.7	32	1.7	278	14.5	2	.1
1884.....	19,846	503	25.3	37	1.9	158	8.0	4	.2
1885.....	19,693	547	27.8	35	1.8	158	8.0	13	.7
1886.....	19,299	522	27.0	32	1.7	157	8.1	7	.4
1887.....	19,135	488	25.5	32	1.7	155	8.1	8	.4
1888.....	18,902	422	22.3	39	2.1	116	6.1	5	.3
1889.....	18,457	477	25.9	30	1.6	122	6.6	7	.4
1890.....	18,278	451	24.7	24	1.3	99	5.4	4	.2
1891.....	18,273	457	25.0	32	1.8	108	5.9	4	.2
1892.....	17,876	486	27.2	34	1.9	134	7.5	4	.2
1893.....	18,187	470	25.8	29	1.6	133	7.3	1	.1
1894.....	18,528	416	22.5	43	2.3	227	12.3	3	.2
1895.....	18,546	452	24.4	39	2.1	143	7.7	4	.2
1896.....	18,612	461	24.8	32	1.7	145	7.8	4	.2
1897.....	18,737	431	23.0	34	1.8	110	5.9	4	.2
1898.....	18,955	535	28.2	44	2.3	113	6.0	2	.1
1899.....	18,835	564	29.9	40	2.1	140	7.4	1	.1
1900.....	19,546	443	22.7	39	2.0	198	10.1	1	.1
1901.....	20,491	559	27.3	57	2.8	93	4.5	2	.1
1902.....	20,655	644	31.2	43	2.1	104	5.0	2	.1
1903.....	21,829	604	27.7	44	2.0	117	5.4	1	.....
1904.....	22,786	597	26.2	57	2.5	125	5.5	.....	.....
1905.....	23,682	640	27.0	37	1.6	117	4.9	.....	.....
1906.....	24,252	626	25.8	59	2.4	130	5.4	1	.....
1907.....	25,094	695	27.7	54	2.2	132	5.3	1	.....
1908.....	25,940	711	27.4	53	2.0	108	4.2	8	.3
1909.....	26,524	668	25.2	50	1.9	118	4.4	3	.1
1910.....	25,984	716	27.6	33	1.3	79	3.0	1	.....
1911.....	26,354	669	25.4	19	.7	91	3.5	5	.2
1912.....	27,508	738	26.8	13	.5	36	1.3	3	.1
1913.....	27,935	792	28.4	16	.6	115	4.1	2	.1
1914.....	28,338	762	26.8	19	.7	59	2.1	2	.1
1915.....	27,850	693	24.9	20	.7	68	2.4	8	.3
1916.....	28,509	690	24.2	13	.5	68	2.4	.....	.....
1917.....	28,239	694	24.6	17	.6	73	2.6	5	.2
1918.....	28,860	704	27.2	14	.5	49	1.9	1	.....
1919.....	24,483	616	25.2	13	.5	51	2.1	1	.....

INFANT MORTALITY.

GENERAL TABLE 2.—*Infants under 1 year of age in foster homes at beginning of year, and admissions and withdrawals during year, 1908-1918.*¹

Year.	At beginning of year.	Infants under 1 year of age in foster homes.					
		Admitted during year. ²			Withdrawn during year. ³		
		Total.	Under 6 months.	6 months, under 1 year.	Total.	Under 6 months.	6 months, under 1 year.
1908.....	108	353	261	92	124	57	67
1909.....	200	363	276	87	166	83	83
1910.....	173	296	230	66	143	63	80
1911.....	139	315	254	61	118	55	63
1912.....	160	327	275	52	142	75	67
1913.....	175	359	274	85	149	59	90
1914.....	171	399	331	68	151	70	81
1915.....	225	347	266	81	131	59	72
1916.....	194	308	217	91	114	45	69
1917.....	172	264	206	58	122	46	76
1918.....	190	278	201	77	101	36	65

¹ Compiled from Reports of Education Department, "E-4," Education: Special Schools, and Juvenile Probation System and Infant-Life Protection, 1909-1919. New Zealand.

² Includes the children adopted with premium exclusive of those already on the books.

³ Includes removal by parent or guardian, death, adoption from licensed home without premium, grant of exemption to home in which child is placed, brought under operation of the industrial schools act, and other causes.

⁴ At end of year, 192.

GENERAL TABLE 3.—*Decline in death rate among children under 6 years of age in foster homes, 1908-1918.*¹

Year.	Children under 6 years of age.			Year.	Children under 6 years of age.		
	In foster homes at any time in year.	Deaths.			In foster homes at any time of year.	Deaths.	
		Number.	Per 100 in homes at any time of year.			Number.	Per 100 in homes at any time of year.
1908.....	1,017	26	2.6	1914.....	1,423	20	1.4
1909.....	1,181	25	2.1	1915.....	1,440	14	1.0
1910.....	1,183	26	2.2	1916.....	1,250	17	1.4
1911.....	1,183	13	1.1	1917.....	1,361	12	.9
1912.....	1,228	12	1.0	1918.....	1,349	6	.4
1913.....	1,330	13	1.0				

¹ Source: Reports of the Department of Education, Education: Special Schools, Juvenile Probation System and Infant-Life Protection, "E-4," 1909-1919.

GENERAL TABLE 4.—*Infants under 1 year of age in exempted institutions at beginning of year, and admissions during year, 1909-1918.*¹

Year.	Infants under 1 year of age in exempted institutions.		Year.	Infants under 1 year of age in exempted institutions.	
	At beginning of year.	Admitted during year.		At beginning of year.	Admitted during year.
1909.....	(²)	161	1914.....	56	233
1910.....	76	177	1915.....	96	121
1911.....	75	190	1916.....	48	68
1912.....	86	175	1917.....	29	112
1913.....	62	139	1918.....	41	141

¹ Source: Reports of the Department of Education, Education: Special Schools, Juvenile Probation System and Infant-Life Protection, "E-4," 1909-1919.

² Not given in source.

GENERAL TABLE 5.—Decline in death rate among children in exempted institutions, 1909–1918.¹

Year.	Children in exempted institutions at any time in year.	Deaths.		Year.	Children in exempted institutions at any time in year.	Deaths.	
		Number.	Per 100 in institutions at any time in year.			Number.	Per 100 in institutions at any time in year.
1909.....	749	66	8.8	1914.....	944	37	3.9
1910.....	915	63	6.9	1915.....	1,026	11	1.1
1911.....	899	47	5.2	1916.....	939	9	1.0
1912.....	911	36	4.0	1917.....	1,136	15	1.3
1913.....	984	18	1.8	1918.....	955	15	1.6

¹ Source: Reports of Department of Education; Education, Special Schools, Juvenile Probation System and Infant-Life Protection, "E-4," 1912-1919. The source does not state the age limits of children in exempted institutions.

GENERAL TABLE 6.—Medical practitioners on register, New Zealand, 1914–1919.¹

Year beginning Jan. 1—	Medical practitioners on register.	Year beginning Jan. 1—	Medical practitioners on register.	Year beginning Jan. 1—	Medical practitioners on register.
1914.....	1,240	1916.....	² 948	1918.....	969
1915.....	1,268	1917.....	² 962	1919.....	985

¹ Source: New Zealand Official Year-Book, 1918, p. 174; 1919, p. 207.

² During 1915, 340 names were removed from register; in 309 cases the letter of inquiry was not delivered but was returned to the registrar general; 20 ceased to practice, and 11 were reported dead. During 1916, 18 names were removed from register on the ground that the "letter was not delivered and was returned to registrar general."

GENERAL TABLE 7.—Proportion of breadwinners in the population 10 years of age and over, by sex and age, New Zealand, 1916.¹

Age group.	Population 10 years of age and over.					
	Males.			Females.		
	Total.	Breadwinners.		Total.	Breadwinners.	
		Number.	Per cent.		Number.	Per cent.
10 years of age and over.....	422,115	355,049	84.1	422,461	190,255	23.7
10-14.....	53,532	3,854	6.9	53,693	1,578	2.9
15-19.....	45,012	38,053	84.5	46,392	22,953	49.5
20-24.....	30,419	29,701	97.6	46,759	22,984	49.2
25-44.....	169,080	166,494	98.5	174,149	86,762	21.1
45-64.....	91,842	89,600	97.6	77,059	12,398	16.1
65 and over.....	29,539	26,791	90.7	23,857	3,389	14.2
Unknown.....	691	556	80.5	575	121	21.0

¹ Compiled from Results of a Census of the Dominion of New Zealand, 15th October, 1916, Part 1X, Occupations and Unemployment, pp. 2-3.

GENERAL TABLE 8.—*Economic status of breadwinners, by occupation group and sex, New Zealand, 1916.*¹

Occupation group.	Breadwinners.								
	Total.		Per cent with specified economic status.						
	Number.	Per cent distribution.	Employer.	In business on own account (not an employer).	Relative assisting but not receiving wages.	Working for wages or salary.	Wage earner unemployed.	Classification inapplicable.	Unspecified.
MALES.									
Total.....	355,049	100.0	12.2	15.7	3.4	62.2	1.7	3.8	1.0
Professional.....	24,797	7.0	9.1	8.7	.2	77.0	1.2	2.8	1.1
Domestic.....	10,119	2.9	16.4	13.2	1.2	66.1	2.8	.....	.2
Commercial.....	49,490	13.9	14.5	12.6	.8	65.7	1.5	4.3	.6
Transport.....	40,253	11.3	2.8	5.9	.2	89.2	1.5	.1	.2
Industrial.....	97,045	27.3	9.8	7.6	.3	79.1	2.7	.....	.5
Agricultural, pastoral, mineral, and other primary producers.....	122,814	34.6	17.5	29.6	9.2	40.6	1.1	.....	2.1
Indefinite.....	10,531	3.0	.....	.....	.....	.....	.....	100.0	.....
FEMALES.									
Total.....	100,255	100.0	2.6	7.9	8.3	74.1	1.2	5.0	0.9
Professional.....	17,303	17.3	1.1	12.7	.5	74.9	1.2	8.3	1.3
Domestic.....	31,796	31.7	2.3	3.6	3.7	87.9	1.6	.3	.7
Commercial.....	16,714	16.7	2.3	7.7	4.7	78.7	1.4	4.6	.7
Transport.....	2,269	2.3	.6	.2	1.5	97.0	.6	.....	.....
Industrial.....	19,874	19.8	2.4	10.0	.9	84.6	1.1	.1	1.0
Agricultural, pastoral, mineral, and other primary producers.....	9,685	9.7	8.4	13.4	62.6	12.9	.2	.8	1.7
Indefinite.....	2,613	2.6	.....	.....	.....	.....	.....	100.0	.....

¹ Source: Results of a Census of the Dominion of New Zealand, 15th October 1916, Part IX, Occupations and Unemployment, pp. 4, 5.

GENERAL TABLE 9.—*Proportion of illegitimate births, New Zealand, 1877-1919.*¹

Year.	Illegitimate births.	Per cent of total births.	Year.	Illegitimate births.	Per cent of total births.
1877.....	351	2.1	1899.....	829	4.4
1878.....	429	2.4	1900.....	906	4.6
1879.....	415	2.3	1901.....	937	4.6
1880.....	471	2.4	1902.....	921	4.5
1881.....	534	2.9	1903.....	994	4.6
1882.....	546	2.9	1904.....	1,029	4.5
1883.....	534	2.8	1905.....	1,082	4.6
1884.....	587	3.0	1906.....	1,132	4.7
1885.....	630	3.2	1907.....	1,157	4.6
1886.....	602	3.1	1908.....	1,105	4.3
1887.....	617	3.2	1909.....	1,223	4.6
1888.....	577	3.1	1910.....	1,162	4.5
1889.....	612	3.3	1911.....	1,078	4.1
1890.....	603	3.3	1912.....	1,177	4.3
1891.....	638	3.5	1913.....	1,181	4.2
1892.....	593	3.3	1914.....	1,302	4.6
1893.....	673	3.7	1915.....	1,152	4.1
1894.....	704	3.8	1916.....	1,146	4.0
1895.....	835	4.5	1917.....	1,159	4.1
1896.....	834	4.5	1918.....	1,179	4.6
1897.....	826	4.4	1919.....	1,138	4.6
1898.....	801	4.2			

¹ Compiled from Statistics of the Colony (Dominion) of New Zealand, 1877-1919.