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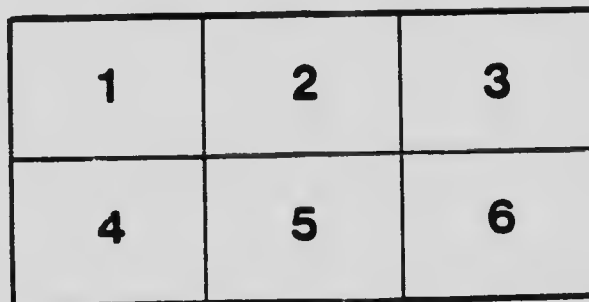
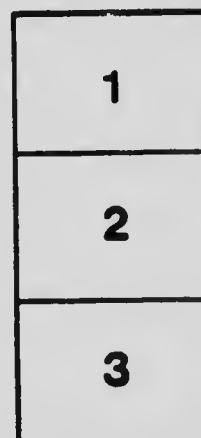
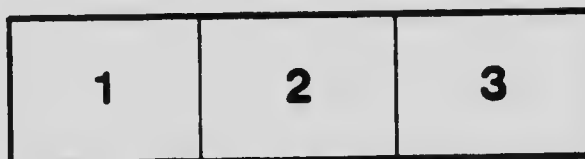
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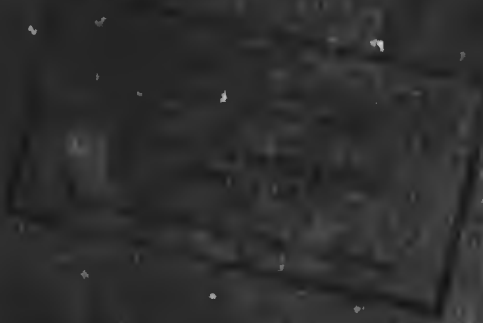
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Conservation of
Man-power in Canada

By P. G. BRYCE, M.A., M.D.



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**Conservation of
Man-power *in* Canada**

A National Need

BY

P. H. BRYCE, M.A., M.D.

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OTTAWA—1918

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Conservation of Man-Power in Canada

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P. H. BRYCE, M.A., M.D.

THAT there is an urgent demand for the conservation of man-power in Canada, at a time when we are suffering from the loss of so many of the defenders as well as wage-earners of the country, does not need demonstration; but, as will be seen in the following statistical and economical study of the character and distribution of the present population of Canada, a more exact idea of what constitutes the basis of man-power, from the public health standpoint, should become generally understood. We commonly recognize two chief means of increasing the man-power of a country; viz., that of the natural increase through births and that of immigration; but, as we shall see in the figures in subsequent tables, the conservation of child life, or, in other words, the saving of lives in infancy as well as saving in later years, is of equal importance with that of the number of children born.

Distribution of Population

In a country of such enormous area as Canada, the distribution of population plays an important part, not alone in the question of man-power, but likewise in the means for its conservation. The following table illustrates the sparse distribution of this population, estimated by provinces:

TABLE 1.—AREA OF CANADA AND POPULATION PER SQUARE MILE

	Area, square miles	Acres	Population per square mile
Canada	1,729,665	685,600	1.93
Alberta	255,285	102,100	1.47
British Columbia	355,855	140,000	1.09
Manitoba	73,731	29,400	6.18
New Brunswick	27,985	11,000	12.61
Nova Scotia	21,427	8,400	22.98
Ontario	260,862	103,600	9.67
Prince Edward Island	2,184	87,700	42.91
Quebec	351,873	139,720	5.69
Saskatchewan	251,700	100,500	1.95
Yukon	207,076	82,840	

The distribution of population per square mile in the several provinces, as seen in the table, teaches us so much regarding the public health problems involved that, to this end, it was necessary

to turn to the comparative distribution of population in urban as compared with rural centres.

TABLE 2.—DISTRIBUTION OF POPULATION IN CANADA

	Total population	Urban	Rural	No. of cities over 4,000
Canada	7,201,838	1,280,104	5,921,734	107
Alberta	374,661	46.3%	61%	5
British Columbia	492,480	52%	48%	7
Manitoba	455,614	44%	56%	4
New Brunswick	351,889	35%	62%	4
Nova Scotia	492,138	38%	62%	12
Ontario	2,523,274	51%	47%	45
Prince Edward Island	91,728	16%	81%	1
Quebec	1,002,712	48%	52%	22
Saskatchewan	492,412	27%	73%	4

When the density of population per acre in cities such as Ottawa varies from 10 to 45 per acre, it can be seen how the complexity of the public health problem varies; but when, even in Ontario, there are but 20 cities of over 10,000 population, 20 towns of over 4,000, besides 267 smaller villages and towns and 542 rural townships, it is evident that, if density of population has a definite sanitary meaning, then the problems in our several provinces must vary greatly. This is shown by the following table, which includes the percentages of the total population in the several classes of municipalities of Ontario:

TABLE 3.—POPULATION IN DIFFERENT CLASSES OF MUNICIPALITIES IN ONTARIO

Total	2,523,274	
Cities (20)	1,002,320	40%
Towns (20)	160,495	7%
Villages (267)	266,456	11%
Townships (542)	1,013,559	42%

The aggregate proportion of population in the large urban communities is given in Table 4, which shows the cities in the different provinces of Canada of 10,000 population or over.

TABLE 4.—CITIES IN CANADA OF 10,000 POPULATION AND OVER, IN 1911, BY PROVINCES

Alberta	3 cities	Ontario	15 cities
British Columbia	3 "	Prince Edward Island	1 "
Manitoba	2 "	Quebec	9 "
New Brunswick	2 "	Saskatchewan	3 "
Nova Scotia	3 "		

Development of Public Health Organizations The development of public health organizations in the several provinces of Canada has in the past varied both in extent and character. This can readily be understood from a glance showing the different provincial health appropriations; while the efficiency of public health work in any province may also be fairly accurately estimated by the relative death rate per 1,000, so far as obtainable. Unfortunately, recent information on this point is not possible for all the provinces over a series of years, except so far as Departments of Vital Statistics exist in the several provinces, since the last attempt to obtain such figures is the census of Canada in 1901.

TABLE 5.—BIRTHS AND DEATHS BY PROVINCES IN 1915

Province	Population	Total births	Rate per 1,000	Total deaths	Deaths per 1,000	Deaths under 1 year	Deaths per 1,000 births	Deaths 0-4 years	Percentage of deaths in estimated population for age period
Quebec	2,176,350	83,294	37.9	15,993	16.5	12,775	147	16,516	6.1
Ontario	2,767,150	67,012	24.2	11,291	12.0	6,838	102	8,612	2.6
Nova Scotia	496,000	12,450	25.1	8,015	16.0	1,555	125	2,150	1.7
Manitoba	531,096	17,812	30.4	5,379	10.1	1,888	105	2,371	2.6

Increased Man-power by Immigration Apart from the knowledge that we gain from vital statistics, there is another very important factor which enters into the estimation not only of the existing, but of the potential, man-power of any community, namely, the amount of emigration, or the loss of population by removal from its native province. On the other hand, if the population of Canada by age periods in 1901 is compared with the population in the Western Provinces in 1916, it will be seen that a further factor affecting this man-power is due to the proportionately large number of persons in the age periods from 25 to 45 years contained in any given number of immigrants. It is evident that any exodus resulting in a permanent loss through emigration means that families and young men would leave Canada, just as similar families and young men come in as immigrants, with a proportion of children of 14 years and under of about 20 per cent of the total, as compared with 34 per cent within this age period in a normal population. That such a loss to Canada did actually take place is shown by the following figures:

TABLE 6.—SHOWING VARIATIONS IN THE RELATIVE POPULATION BY AGE PERIODS

	Average per 1,000,000 in 1901 for England, United States and Canada	Average in Ontario in 1901	Average in 1916 for Manitoba, Saskatchewan and Alberta
0-14 years	33.6%	34.0%	36.2%
15-24 "	19.7		16.9
25-34 "	15.5	43.6%	18.9
35-44 "	11.1		13.2
45-54 "	9.7		7.5
55-64 "	6.5	25.3%	4.0
65 and over.....	7.1		3.2
			49.0%
			14.7%

These figures show quite notable variations in the percentages of population by age periods. A study of the census of the United States and Canada during the past century shows that the natural increase by births in any census period has been at least 15 per cent. Applying this rule to the population of Canada, we find that during 1881-1891 there was an actual deficit of 107,347, and of 169,995 in 1891-1901. When it is realized that between 1881-90 there was an immigration of 392,603, and of 324,333 between 1891 and 1900 the actual total loss of man-power by Canada during this period may be appreciated.

TABLE 7.—SHOWING ESTIMATED LOSS OF POPULATION BETWEEN 1881 AND 1901

	Population	Natural increase of 15 per cent	Immigration	Constructive loss
1881.....	4,268,364	4,938,618	392,603 (1880-1890)	500,150
1901.....	4,801,071	5,521,181	324,333 (1890-1900)	494,325

A further remarkable, but inevitable, outcome of this exodus of persons, especially of the productive age periods, is seen in a definitely increased annual death rate. Thus, as seen in Table 6, the population in Ontario of over 44 years, in 1901, constituted 25.3 per cent of the total. The correlative of this is found in the death rate for the same period. Of this total of 29,608, some 14,058 occurred within the age period of 45 years and over. As compared with this, the deaths in the ten cities of Ontario in 1914 show that only 40 per cent of the total deaths occurred in the age period over 44, so that in a virile normal population not only are there at least 6 per cent more persons

in the age periods under 45 years, but there is also less by 10 per cent of an annual death rate. The direct bearing of such figures upon the man-power of Canada is seen by applying this difference of 10 per cent to the population under 45 in 1901 in those provinces whose increase was notably below the normal in 1911. Thus, in the three Maritime Provinces the combined population of 937,955 would, in 1911, have had 46,897 added, in the census period, to the active population under 45, plus 1,750 fewer deaths in a year; or a gain of nearly 50,000 in the chief wage-earning period.

Results of Migration

On the other hand any permanent migration will reduce the man-power for any given population to the same extent. A yet clearer appreciation of what man-power in a population means is obtained by applying to an old population the rates for age periods of the three Western Provinces in 1916, where, with but 14.7 of the population older than 45 years, 10.6 per cent, or some 40,000, would be added to the population of the Eastern Provinces for the age period under 45 years.

Not only, however, as we have seen, does migration from rural areas reduce the man-power for agriculture, the primary industry of Canada, but its correlative is, further, a decline in the annual rural birthrate. Thus, in Ontario counties without large towns, this rate varies from 15 to 20 per 1,000, and averages probably 18 per 1,000. The ten Ontario cities in 1915 had an average of 28 births per 1,000, with a death rate of 12.8, or a natural increase of 15.8 per 1,000. Such must be considered comparatively satisfactory; but the increase of children under 1 year, as seen in the following comparison, also varies greatly in different classes of municipalities.

TABLE 8.—DEATHS OF CHILDREN UNDER ONE YEAR PER 1,000 BIRTHS IN ONTARIO

	1913	1914	1915	1916
The Province.....	117.7	103.2	102.0	107
City municipalities.....	140.3	116.9	144.3	121
Town ".....	148.3	129.9	110.0	129
Rural ".....	95.7	88.8	92.8	92

Such differences give much force to the statement in the *Report of the Local Government Board of England*, for 1915-16, that "there is no insuperable difficulty in reducing the total deaths in childhood to one-half their ordinary number;" while this statement is fortified by

the statistics for New York City, where the death rate of children under one year in 1898 of 197 per 1,000 was reduced to 98.2 in 1915, a decline of more than 50 per cent, or a saving in man-power of over 14,000 per annum in a single city. The averages, based upon the Ontario returns, whose census increase was just 15 per cent in 1911, may be conveniently used for comparison in other provinces. Thus, in any average population, that from 0-4 years is about 12 per cent of the total, and that under one year is about 2.5 per cent. It will be apparent, however, that the percentage increase under one year will be high when the birth rate is high, except as lessened by deaths.

TABLE 9.—SHOWING EFFECT OF VARYING BIRTH AND DEATH RATES IN ONTARIO AND QUEBEC

Province	Popu- lation	Total births	Total deaths	Deaths under 1 year	Deaths 0-4 yrs.	Deaths 5-14	Deaths 15-19	Deaths 20-59
Ontario..	2,767,350	67,032	33,294	6,838	8,632	651	381	4,310
Quebec..	2,176,918	83,274	35,933	12,775	16,516	1,591	853	7,656

From the above table it will be seen that in 1915 the province of Quebec had 83,274 births, or 37.9 per 1,000, which, though lessened by 12,775 deaths, or 150 for every thousand births, left a percentage of 3.2 per cent of the total population under one year. Compared with these figures, the Ontario statistics show that, with a total of 67,032 births in 1915, or 24.2 per 1,000, the deaths were 6,838, or 102 per 1,000 births. If a further comparison be made of the deaths from 0 to 4 years, inclusive, it is seen that there were 16,516 deaths in Quebec as compared with 8,632 deaths in Ontario.

TABLE 9a.—SHOWING PERCENTAGE OF POPULATION BY AGE PERIODS

ONTARIO		QUEBEC	
0-4 year	10.40	0-4 year	14.50
5-14 "	18.60	5-14 "	23.80
15-19 "	9.05	15-19 "	10.00
	38.05%		48.30%
20-24 "	9.07	20-24 "	9.10
25-29 "	9.00	25-29 "	7.70
30-34 "	7.10	30-34 "	6.50
35-39 "	6.90	35-39 "	5.60
40-44 "	5.90	40-44 "	4.60
45-49 "	5.03	45-49 "	4.08
50-54 "	4.60	50-54 "	3.60
55-59 "	3.40	55-59 "	2.80
	51.00%		43.98%
	89.05%		92.28%

The table on page 8 shows that in Ontario 51.00 per cent of the population survive into the productive or wage-earning period of life, 20 to 59 years, as compared with 43.98 per cent in Quebec.

But the supreme importance of saving child life as the basis of the increase of man-power can be shown from comparative figures for 252 United States cities, mostly within the census registration area, and having a total population of 27,100,211. Of these cities 144 made returns to the New York Milk Committee of the death rate of infants under one year for the period 1906-1910, as compared with that for 1915. The reported New York birth rate, which is probably the most complete of any large city in the group, was 25.8 per 1,000 in 1915. The statistics show that for the period 1906-1910, New York had 135.5 deaths, as compared with 98.2 deaths per 1,000 in 1915, and that in the 142 cities the average rate of 140 for 1906-1910 was reduced to 91 for 1915. Thus, the saving in these cities was 0.5 per cent, or 135,000 native born citizens in a single year. A similar comparison for Canadian cities is seen in the following table:

TABLE 10.—SHOWING INFANT MORTALITY IN VARIOUS CANADIAN CITIES

City	Population	Total births	Total deaths	Deaths per 1,000	Deaths under 1 year	Death rate per 1,000 births	Deaths from 0-4 year	Percentage of deaths per population for age period
Montreal, 1912	484,400	19,085	9,685	20.0	3,976	200	4,468	7.0
Toronto, "	414,000	10,960	5,675	13.7	1,582	144	1,964	4.0
Winnipeg, "	166,553	5,041	2,236	13.4	1,006	199.5	1,299	6.0
Montreal, 1916	575,000	16,275	10,093	17.5	3,672	186	4,685	6.25
Winnipeg, "	200,000	5,980	2,072	10.5	700	117	947	4.0
Toronto, "	470,000	13,949	5,892	12.5	1,335	93	1,661	2.9
Vancouver, "	97,995	2,688	1,097	11.9	166	61.8	246	2.0
Halifax	50,000	1,614	1,103	22.1				
St. John, 1916	49,440	1,250	808	16.4	147	120	215	3.0

In 1916 Montreal, Toronto and Winnipeg had an aggregate population of 1,245,000, or about one-sixth of the total population of Canada in 1915. The reduction in the average death rate of children under one year in this population, comparing 1912 with 1916, is 50 per 1,000 births; this, if applied to the total births for the five-year period, means a saving of about 10,000 lives. It is also of interest to note that, while the reduction in infant mortality was 14 per 1,000 in Montreal, in Toronto it was 57, and in Winnipeg 72. If the Winnipeg rate of reduction in deaths were applied to Montreal, her saving of lives in 1916 would have been 1,171.

Sanitation
Conserves
Lives

But the saving of lives, begun in children under one year, is continued by improved sanitary methods and also owing to a reduction of deaths due to the acute contagious diseases. Just what the saving of man-power by preventing child mortality may mean is summed up in the following extract from the *Bureau of Child Hygiene Report (1915)* of New York: "During the past thirty years the infant mortality in New York City has been reduced 66.5 per cent." This is shown by the accompanying table:

TABLE 11.—SHOWING REDUCTION IN DEATHS OF CHILDREN UNDER ONE YEAR, FROM THE FOUR PRINCIPAL CAUSES, IN 1914, AS COMPARED WITH 1884, PER 1,000 BIRTHS IN NEW YORK

	1884, deaths	Rate per 1,000	1914, deaths	Rate per 1,000	Ratio of reduction, per cent
Contagious disease.....	710	20.71	470	3.34	88.7
Diarrheal.....	2,965	86.72	2,957	21.02	75.7
Respiratory.....	1,473	43.08	2,894	20.57	53.40
Congenital.....	1,371	40.10	5,517	39.50	1.5

But the remarkable reduction of infant mortality, due to contagious diseases, so well illustrated in the New York statistics, is continued through all age periods, as is shown by the following statistics for Ontario, extending over a similar period:

TABLE 12.—DEATHS FROM DIPHTHERIA, TYPHOID AND TUBERCULOSIS IN ONTARIO FOR A SERIES OF YEARS

Year	Population	Diphtheria	Per 1,000	Typhoid	Per 1,000	Tuberculosis	Per 1,000
1881.....	1,923,610	1,704	0.89	616	0.32	2,446	1.27
1891.....	2,122,716	955	0.45	239	0.11	2,379	1.12
1901.....	2,184,144	772	0.35	500	0.22	3,243	1.48
1911.....	2,523,274	423	0.16	637	0.25	2,353	0.92
1915.....	2,749,800	443	0.16	358	0.16	2,340	0.85

The reduction in deaths from diphtheria in the years from 1881 to 1915 in Ontario is remarkable. Had the 1881 rate continued it would have caused 2,500 deaths in 1915, instead of 443; therefore the saving from this disease alone is 2,000 annually. Similarly, the typhoid rate has been reduced by 50 per cent, or a saving of 500 lives annually. With regard to tuberculosis, it is certain that the returns in 1881 were incomplete, yet the rate per 1,000 has fallen by one-third; that is, if the 1881 rate had prevailed in 1915, there would have been 3,540 deaths instead of 2,340. The man-power saved from these three diseases alone is 3,500 per annum.

It has not been possible to carry the comparison back so many years in Quebec; but from statistics available the diphtheria rates show a notable decline, which is most marked in rural districts. Thus, since 1896, the rate for diphtheria has fallen from 1.33 to 0.30 per 1,000 of population. Typhoid, however, shows no decline. The deaths from tuberculosis, though high, still show a decline from 175 in 1911 to 147 per 1,000 in 1915; but it is probable that the improved death returns make the situation seem less favourable than it really is.

But, however great is the saving of life in childhood, through the various means indicated, the state has established, at six years of age, a relationship, through the public school, with the family, which enables it to make an accurate estimate of the future material of its man-power. Prussia, as long ago as 1847, had established in Berlin the Central School of Gymnastics, and medical inspection of school children has been general there for many years. Not, however, until England's experience with recruits for the army in the Boer war in 1899 did she realize what the actual proportion of national defectiveness was; but only in 1907 was the Act for Compulsory Medical Inspection of School Children passed. The *Report of the Chief Medical Officer of Education* for 1914 states that 1,900,000 children were handled and 350,000 examined annually, of whom 75,000 received treatment. If this number be compared with the number of men rejected in the effort to secure 3,000,000 men within the military-age period for Kitchener's Army some idea of the physical and mental defectives can be obtained.

During the last five years in some cities in Canada, and for over ten years in New York and Boston, the inspection of school children has revealed many defects; but the following figures, based upon a careful examination of the children of three village and seventeen rural schools in one of the most progressive districts of Ontario in 1914, reveal the actual conditions in such communities, illustrated by many similar surveys in the United States:

TABLE 13.—RESULTS OF EXAMINATION OF SCHOOL CHILDREN IN AN ONTARIO DISTRICT IN 1913

	Number	Number defective	Number of defects
Group I.....	821	432	659
" II.....	571	347	512
" III.....	38 children in one room		Defective vision.....19
" IV.....	50 children in one room		Defective vision.....21

NOTE.—The defects found in Group I included: Impaired vision, 104; carious teeth, 207; defective nasal breathing, 69; enlarged glands, 19; anæmia, 37; ringworm, 1; pediculosis, 12. Total, 512 in 821 children inspected.

**Defective
Child-life**

The Chief Medical Officer for Manitoba, in 1917, stated that, of 726 children in one district, 35 were found suffering from scarlet fever and diphtheria, 32 had defective hearing, 70 defective vision, 486 had adenoids and enlarged tonsils, and 489 required attention to teeth; and this is only a part of the real facts. In 1910, Dr. George Carpenter, physician to Queen's Hospital for Children, London, England, was engaged by the School Board as medical inspector. Organizing a clinic, with his assistant and nurse, in the school he made a complete examination of 459 children, presumably healthy, 249 boys and 210 girls, between 3 and 7 and 10 and 15 years. There were 81 with hernia, 234 with weak ankles or flat feet, 200 were rickety and 270 had beaded ribs, 101 had protuberant abdomens and 7 enlarged glands. In 367 the teeth were decayed, averaging 4 per girl and 4½ per boy; 119 had enlarged tonsils and 129 adenoids; 21 were deaf from ear catarrh and 9 had perforated ear drums. In 181 the deep cervical glands were enlarged, in 337 the superficial and in 252 the inguinal glands; 29 had bronchitis, 1 pneumonia and 1 transferred heart. Various other diseases were present, such as heart disease and tuberculosis.

TABLE 14.—SHOWING PERCENTAGE OF TUBERCULOUS RECRUITS FOR UNITED STATES ARMY IN 1917

Total examined	Total tuberculous
5,587 of Illinois Militia	5 per cent
95 of New York National Guard examined by skiagraph	9.5 per cent

NOTE:—Of 1,706 examined in one district of Illinois the total disqualified for physical defects was 350, including 3.7 per cent tuberculous; while in New York state, of 95 recruits, 12.6 per cent in all showed thoracic disease by means of the skiagraph.

It would have proved of still greater value to this study had the Canadian Department of Militia and Defence supplied an accurate tabulation of the physical and mental defects of all recruits examined; but the following statement of the results of 883 examinations at one of the recruiting stations of Ontario, carried out under the direction of Captain C. J. Withrow, gives most valuable information. Of the total, 32.7 per cent were rejected, while 47.9 appear in Class A2, and 19.8 in B, C and D.

CONSERVATION OF MAN-POWER IN CANADA 13

TABLE 14a. -ANALYSIS OF 883 EXAMINATIONS OF RECRUITS AT A MEDICAL BOARD CENTRE IN CANADA

	Number	Per cent
Total accepted A2	402	47.7
" " A2, illiterate	20	
" " B, C, D	169	19.8
" " illiterate	9	
Total in Class E, rejected		32.7
Hernias	42	4.7
Underweight or undersize	38	4.2
Deformities from old accident or disease	28	3.2
Hemorrhoids	21	2.3
Mental deficiency	20	2.2
Varicose veins	20	2.2
Tuberculosis	18	2.0
Asthma	4	0.5
Osteomyelitis	4	0.4
Old Pott's fracture	3	0.1
Graves disease	3	0.3
Knee joint affections	3	0.3
Rheumatic fever	11	1.2
Chronic otorrhoea	10	1.1
Valvular disease of heart	10	1.1
Sight or hearing	9	1.0
Various amputations	9	1.0
Results of infantile spinal paralysis	5	0.5
Epilepsy	5	0.5
Stammering	2	0.2
Active syphilis, primary and secondary	2	0.2
Under-age	2	0.2
Over-age	1	0.1
Anal fistula	3	0.3
Chronic eczema	2	0.2
Diseases of spine	2	0.2
Congenital excessive torticollis	1	0.1
Discharging sinns in neck	1	0.1
Chronic laryngitis	1	0.1
Chronic gonorrhoea recurrent	1	0.1
Scoliosis	1	0.1
Insanity	1	0.1
Diabetes	1	0.1
Night blindness	1	0.1
Tachycardia	1	0.1
Deafmutism	1	0.1
Extensive callous soles of feet	1	0.1
Prolapse of rectum	1	0.1
Illiterates in Class A2	20	
Illiterates in Class B, C, D	9	
Illiterates in Class E	21	
Mental defectives	20	7.1
Insane	1	8.0

It is this general prevalence of defects found in school children, and proved to exist in persons in later life, which must become the measure of the loss of man-power which every progressive nation today must combat to lessen or prevent economic loss. That such loss will vary with climate, occupation, age, sanitary and social surroundings is obvious; but that health for the different age-periods

should become standardized, just as truly as that of farm stock or the effectiveness of an army machine, is being made plain today, not more from the needs of the situation than from what has been accomplished.

Unemployment Through Ill-health Obviously, what is first necessary is to obtain the facts regarding existing conditions in every community. This is being here and there worked out by sanitary surveys of local areas. In August, 1915, and in February, 1916, a survey of a New York area, holding 30,000 persons, was made by the Board of Health. It was a dense district, but still one in which, owing to the age and type of population, the mortality is lowest. At both extremes of life the incidence of disease was found to be greatest, and greater in both in February than in August; yet, further, in the group between 5 and 14 years, the incidence of sickness was four times as high in February, on account of contagious diseases. It is remarked: "The excessively high rate amongst the unemployed must be attributed to the fact that ill-health was the cause of unemployment of many in this group. Of the 757 sick, or 2.5 per cent of the total population in February, 75 per cent were incapacitated, while more than one-fifth were in hospitals or sanatoria, pensioners of the public." Comparing the August with the February census, and striking an average, the report states, it may fairly be said that every day in the year there would be 548 cases sick, or, say, 500 in 30,000, or 1 in every 60; of whom 300 are incapacitated—just 1 per cent. In 33 cases of tuberculosis the duration was over 3 years. Of the total 79 per cent received treatment from a physician and 11 per cent used family remedies. Of the 79 per cent, there were 34 who received treatment by private physicians, 35 per cent from dispensaries and 10 per cent in hospitals. On an estimate of \$1 for cost of treatment and drugs, the lost earning capacity in wages to this community would be \$200,000 annually, or \$40 per family, equal to \$400,000,000 for all New York.

Discussing the general result of this sickness census the report states:

"While much is to be done in combatting the ravages of the infectious diseases, we have, nevertheless, accomplished so much in reducing their incidence and mortality, that we may now turn our attention to those other diseases which, while not communicable or infectious, are nevertheless preventable. We refer particularly to the degenerative diseases. Nor is prevention of these diseases an easy matter, calling for such simple sanitary precautions as isolation, quarantine and the like—measures which the department clearly has the power to enforce; but rather does the prevention of these diseases lie in attacking the social problems of today, and in attacking those problems over which the power of the department is perforce limited. Our study of the mortality of the city, by sanitary areas, has supplied

us with ample proof that family income is a most important factor in raising or lowering mortality."

Reverting to the statement that the degenerative diseases are especially demanding the attention of modern society, we have in tuberculosis and syphilis, two which especially affect the man-power of the wage-earning age periods. In the New York survey previously reported, it was stated that in 33 cases of tuberculosis, the sickness had averaged three years. Setting aside the danger to others, and assuming that these represented one in ten of those sick, the loss in a single year through them was \$2,000,000. If applied to Canada, where there are annually about 8,000 deaths, averaging two years at least of invalidism, the loss on this basis would amount to over \$3,000,000 annually, not to mention the poverty resulting from the loss of the wage-earner.

The full meaning of this will be appreciated by a comparison of the deaths from tuberculosis in 1901 and 1916 in two Ontario cities, Hamilton and Ottawa.

DEATHS FROM TUBERCULOSIS IN 1901 AND 1916

	Year	Population	Deaths from tuberculosis	Rate per 1,000 population
Ottawa	1901	59,938	139	2.2
Hamilton	1901	52,034	95	1.6
Ottawa	1916	96,720	133	1.37
Hamilton	1916	104,330	87	0.80

It will be seen that the two cities have increased in population since 1901 at much the same rate; but, while the number of deaths in each from tuberculosis was high in 1901, the decline in both, while notable, has been almost unprecedented in Hamilton, amounting to 75 per cent, if allowance be made for population increase. Eleven years ago Hamilton established a sanatorium and Ottawa did so four years later. During the year 1916-1917 the two sanatoria had the number of inmates as shown in the following table:

TABLE SHOWING SANATORIUM EXPENDITURES AND WORK DONE

	Total inmates	Total hospital days	Total days' stay	Total deaths	Total expenditure	Daily cost
Ottawa	211	20,245	95	51	\$35,569.66	\$1.66
Hamilton	246	34,852	142	12	\$41,276.44	\$1.18

The table shows that, with 35 more patients, Hamilton had only 12 deaths, as compared with 51 in Ottawa. It further appears that, while in Hamilton each patient received 142 days' treatment, in

Ottawa each had but 95 days. The per diem cost, moreover, was but \$1.18 in Hamilton as compared with \$1.66 in Ottawa. To explain the very remarkable differences, both in deaths and cost, it is necessary to examine the figures in the following table:

TABLE SHOWING SANATORIUM CASES BY AGES
IN OTTAWA AND HAMILTON

Age period	Ottawa March 1st, 1916, to March 1st, 1917	Hamilton October 1st, 1915, to September 30, 1916
0-9	2	48
10-11	16	10
15-19	38	22
20-24	62	36
25-29		43
30-34	38	30
35-39		12
40-44	32	9
45-49		2
50-54	9	1
55-59		1
60 and over	1	2
Total	211	246

It is seen that, while Hamilton treat 188 patients of 11 years and under, Ottawa treated but 18. As is now known, owing to the slowly progressive character of the disease in childhood, there are relatively few deaths at this age, but if their treatment and recovery does not now take place, such appear in increasing numbers, both in the hospitals and death list, during the later wage-earning periods of life. This is seen in the following table:

TABLE GIVING DEATHS FROM TUBERCULOSIS IN 1916 IN
OTTAWA AND HAMILTON, BY AGE PERIODS

Form of disease	0-14 years	15-19 years	20-29 years	30-39 years	40-49 years	50-59 years	60 and over
Tuberculosis of lungs	0 11	19 11	0 11	0 11	19 11	19 11	0 11
Acute miliary	0 3	16 8	31 18	28 25	18 8	9 7	7 7
Meningeal	6 1	1 1	1 0	1 0	0 0	0 0	0 0
Abdominal	1 4	2 1	0 2				
Other forms	2 0	1 0	3 1	0 0	0 2	0 0	0 0
	2 0	11 0	0 0	1 0	0 2	0 6	0 0
	14 8	20 7	35 21	30 25	19 12	9 7	7 7

Thus, in the 0-19 year age period Hamilton had only 15 deaths, as compared with 51 in Ottawa, while in the period of 20-59 years there were in Hamilton but 65 deaths, as compared with 92 in Ottawa.

Several remarkable results follow these notable differences. The first is the much longer time possible for sanatorium treatment for the same cost when children are treated as compared with adults. Thus, while Ottawa had 35 less patients and 47 less days of treatment per patient, the cost, on the Ottawa per diem basis was \$9,717.60 more than it would have been at the Hamilton rate. The second result is seen in the greatly decreased total death rate and the notable saving in man-power during the wage-earning period, Hamilton having saved 37 such lives in a single year. Whatever the anticipated earning power be for each, whether \$1,000 or \$5,000, it is plain, since the average loss of full labour capacity before death in tuberculosis cases is estimated as averaging three years, that even at the lower figure Ottawa lost \$37,000, apart from the impoverishment of the patient and the infection of children in the home.

Speaking of the results of the early treatment of children in children, the superintendent of the Hamilton Sanatorium, referring to the tubercularized soldier, "And our experience with the soldier goes to show that the eradication of tuberculosis will not come through the protection of the adult but through the protection of the child."

Ravages of Venereal Diseases

With regard to syphilis, another especially general and active disease, the discovery within recent years of its germ, or cause, has rapidly brought the preventing or minimizing of it into public prominence. Unlike almost every other disease, syphilis is directly transmitted from parent to offspring, causing in these offspring 50 per cent of death before birth, while, as reported by Hanfmann, in nine syphilitic conceptions, 96 per cent of the pregnancies in mothers resulted in 13 living infants, of whom only one seemed normal. It is generally estimated that 25 per cent of the admissions to insane asylums are syphilitic; that 12 per cent of the hospital patients in large cities have venereal disease; that 75 per cent of syphilitic women are feeble-minded, and that such a source of 75 per cent of the prostitutes. So urgent, indeed, is the need for dealing with this menace to society become that both the social agencies and governments are taking action not only to deal with the victims of this malady, but also to devise broad schemes for its prevention. Denmark, Great Britain and Australia have passed Acts for dealing with venereal diseases and two provinces and several cities in Canada, as well as New York and other American cities, have adopted schemes for the treatment of patients and lessening the dangers of infection. One or two illustrations may be given of what society is paying for its ignorance, misfortune, selfishness or pleasure. The *Report on Hospitals and Charities of Ontario for 1915* gives the following statistics:

TABLE 15—GIVING PATIENTS AND COST OF HOSPITAL MAINTENANCE IN ONTARIO, 1915

Total patients	85,000
Total days' stay of adults	1,076,755
Total days' stay of infants	89,498
Average days of both classes	25.6
Total average cost per diem	\$1.64
Total average cost per annum per patient	\$12.4
Total expenditure on maintenance	\$2,752,467.71
Total population of province	2,767,550
Total public hospitals (including sanatoria)	9
Private hospitals	68
Government grant to houses of refuge and orphanages in 1915	\$109,702.23

The hospital statistics just given illustrate a number of important points, such as,

(a) The remarkable increase in the hospital treatment of disease in Ontario as well as elsewhere in Canada.

(b) The increase in hospitals in Ontario until there is one for almost every two incorporated municipalities.

(c) The large number of persons to whom hospital treatment is given.

(d) The large grants to hospitals in Ontario, being, in 1915, \$303,600 from the province, \$931,109.54 from municipalities and \$1,282,263.95 from patients as board alone. The annual expenditure by the government on hospitals for the insane amounted to \$760,898.26 in 1915-16, to which \$354,145.58, collected from patients and by other taxation, must be added; while for protecting the public, against contagious disease especially, we have the expenditure made by the Provincial Board of Health of \$75,000, apart from that of some 800 local Boards of Health.

Cost of Ill-health

We have been in the habit for so long of thinking of disease as a matter of the individual, that but little thought has been given to the part taken by government in its treatment or suppression; but a perusal of the above statistics gives at least a partial idea of how closely the state is associated with the care of the health of the people. It would seem that at least 60 per cent of the \$4,000,000 annual expenditures on public institutions is supplied from public grants and charitable gifts. But there is, in addition to this, a very large amount of money spent by mutual benefit societies, in which payments are made by contract to physicians for the care of members.

TABLE 16—GIVING FRIENDLY SOCIETIES' INSURANCES IN ONTARIO IN 1916

I—LIFE INSURANCE BENEFIT SOCIETIES		
Number		24
Death benefits paid	\$2,801,969	17
Invalidity benefits paid	169,917	97
II—SICK BENEFIT AND FUNERAL SOCIETIES		
No. of societies		119
No. members reported		135,372
No. of sick members		11,571
Per cent		30
No. of weeks' sickness		220,890
No. of days' sickness for each invalid		17
Average days sick for total membership		11.5
Sick benefits paid	\$966,778	83
Funeral benefits paid	\$118,455	78
Cost of medical attendance	\$96,624	34
Amount paid for relief	\$41,565	42

State
Health
Insurance

With such facts before us, it is inevitable that the question should arise, whether, since the state is spending such enormous sums in the cure of disease and the care of the infirm, it should not carefully investigate the propriety of spending these funds rather in preventing sickness for the sake of increasing the man-power of the state, thereby lessening an unproductive expenditure on curing disease. So clear has this point become to economists elsewhere that Dr. Zahn, Director of Statistics for Bavaria, may be quoted: "By means of a carefully organized body of workingmen's insurance statistics, which indicate the course, cause and consequences of cases of sickness, invalidity and industrial accidents, the principal dangers which threaten the life of the workmen become known, and the manner in which these evils can be most successfully attacked is evident. There follows, in consequence, a systematic campaign against tuberculosis, drunkenness, venereal diseases, the lack of workingmen's dwellings, unemployment, schooling of the workingmen and their families in social hygiene, enlightenment of the insured by regular lectures, etc." As, in any modern industrial country, the number of persons of the wage-earning class is about one-third to one-fourth of the total population, it is apparent that state insurance against sickness would directly affect at least 25 per cent of the whole people. Thus, in Canada, we would expect to have 2,000,000 persons receive such advantages. In Germany, in 1911, some 15,000,000 persons received \$70,000,000 in sick benefits; consequently this scheme, if applied in Canada, would mean that \$10,000,000 would be distributed here in sick benefits in a single year.

Comparing the value of money on this continent, such a scheme in Canada would include all wage earners up to \$1,000 of income, and the assessments, as in England, would be: Employee's share, 4/9; em-

ployer's share, 3/9; government's share, 2/9; while the benefits would include (a) medical benefits, (b) cash benefits, (c) maternity benefits.

I have summarized this scheme of state health insurance elsewhere not only to illustrate how widespread its benefits are but also to show how the very essence of the scheme is to prevent disease; because no possible good can come from disease either to the individual, to the employer or to the state. We have seen that in Ontario hospitals there was expended, for maintenance and nursing alone, upon 85,000 persons \$2,752,467, or over \$32 for each, and yet only one person in every 23 received any of the benefit for which the people were taxed over \$1,250,000. The limited benefits, the relatively high cost, and the very unequal distribution of the ratepayers' funds under our present system, are so obvious as to fully emphasize how some comprehensive scheme is required for securing the care of prospective mothers, establishing child welfare bureaus, appointing social service nurses and insuring the general inspection, treatment and physical training of school children and the control, by every means possible, of the health of those who reach the wage-earning period.

Support
of Medical
Opinion

How this can best be done, in view of the experience in Germany since 1883, and during the past six years in England, is no longer a question. The success of Lloyd George's Compulsory Insurance Act, based upon German experience, in spite of the obstinate opposition to it at first, is not now a matter of discussion. The *British Medical Journal*, in a résumé of the report of a committee of the British Medical Association, states:

"The degree of unanimity so far disclosed is somewhat remarkable, and suggests that the scheme, which is proving a distinct gain to the medical profession as well as to the public, be still further extended to the dependents of insured persons, and for providing, when necessary, specialists and nursing services, institutional treatment, maternity attendance, etc., beyond what can be provided by the general medical practitioner."

British
Ministry
of Health

Its benefits have proved most far-reaching, and so positive has become the people's demand, in view of the enormous war losses, for the conservation of the man-power of the nation that a bill has been introduced in the Imperial House of Commons to establish a Ministry of Health, to co-ordinate the many official health services for more effective work. The following abstract of a memorandum, recently presented to the president of the Local Government Board by the representatives of 1,100 medical officers of health, regarding a Ministry of Health, may properly be quoted as representing the best medical opinion in Great Britain:

MEMORANDUM *re* MINISTRY OF HEALTH

Your memorialists submit that:

1. The present wasteful and inefficient system, by which the responsibility for the nation's health is divided up among so many departments, is to be deplored.

2. That the unification and control of all machinery for such work, both central and local, which is for the maintenance of health and the provision of treatment for the people, is essential.

3. That the establishment of a Ministry of Health, with a Central Health Department, is essential to this end, and that it should include provision for and control of:

- (a) Sanatoria and treatment of tuberculosis
- (b) Provision of isolation hospitals and control of contagious diseases
- (c) Prevention and cure of venereal diseases
- (d) Administration of the Vaccination Acts
- (e) School hygiene and inspection of children
- (f) Supervision of state-provided medical services and state-supported institutions
- (g) Maternity and child welfare work
- (h) Medical research and provision of laboratories
- (i) Control of public water supplies, gathering grounds, etc.
- (j) Housing and town planning
- (k) Sewerage, drainage and abatement of nuisances, etc.
- (l) Ship sanitation and hygiene
- (m) Sanitary control of emigrants and immigrants
- (n) Railway hygiene
- (o) Milk supply and food inspection
- (p) Factory and workshop inspection, hours of work, factory welfare work
- (q) Compilation of vital statistics
- (r) Public health legislation.

4. That the continuous increase of duties placed upon local sanitary authorities by infant welfare centres, school clinics, tuberculosis dispensaries, venereal diseases, clinics, etc., suggests the time as ripe for a considerable extension of these powers and duties in the direction of an increased provision of medical treatment, or the inauguration of a state medical service, as a part of the general public health organization of the country.

Vital
Statistics
Essential

Such are the chief features of the memorandum, which may properly serve to summarize what our statistical and economic study of the situation has shown to be necessary as regards conserving the man-power of Canada. At the basis of this work lies a comprehensive and modern system of vital

statistics for all Canada. Much has already been done, almost every province has organized its vital statistics on a fairly satisfactory basis, and machinery exists, which can be utilized with much advantage, if its efficiency be increased and the returns be co-ordinated and unified. Provinces in which health and social legislation are more advanced can assist by their experience those less developed; while the work of all can be unified and harmonized through the Federal Department of Statistics. The problem before us is one demanding a proper perspective and balanced adjustment of duties, of powers and of financial expenditure. Much has been done in co-ordinating the agricultural, military and other services; surely, the time has arrived to unify and extend those services which directly bear upon the conservation of health of the citizens, and the man-power of every province of Canada and of Canada as a whole.

TABLE 17.—COMPARATIVE VITAL STATISTICS, BY PROVINCES, FOR 1915

Province	Population	Total births	Rate per 1,000	Total deaths	Rate per 1,000	Deaths under one year	Rate per 1,000 births	Deaths 0-4	Rate of total population for age period	Deaths from tuberculosis	Rate per 1,000 population
Ontario.....	2,767,350	67,032	24.2	33,294	12.0	6,838	102	8,632	2.6	2,466	0.89
Quebec.....	2,176,918	83,274	37.9	35,933	16.5	12,775	147	16,516	6.1	3,200	1.47
Nova Scotia.....	507,880	12,770	25.1	7,675	15.3	1,555	127	2,190	3.9	921	1.80
Manitoba.....	31,096	17,832	33.5	5,379	11.3	1,888	105	3,371	3.7	451	0.85
Saskatchewan.....	750,000	17,265	23.0	4,023	7.3	1,525	80	1,821	2.0	298	0.39
Alberta, 1916.....	496,117	12,343	26.87	4,058	8.02	1,207	58	4,132	1.6	425	1.07
British Columbia.....	395,571	10,418	26.58	3,832	9.68	1,591	98	1,591	2.8	297	0.60

TABLE 18.—PUBLIC HEALTH APPROPRIATIONS

	Ontario	Quebec	Nova Scotia	Manitoba	Saskatchewan*	Alberta	British Columbia
Total appropriation.....	\$74,950.46	\$55,000	\$6,525	\$55,000	\$187,000	\$15,000	\$25,130
General expenses.....	32,203.36	20,000			20,000		Salaries not included are in civil list.
Public health works..	6,338.01				37,000		
Laboratories.....	9,348.32				120,000		
Grants to hospitals.....					15,000		
Vital statistics.....	27,061.17				10,000	85,000	
Administrative staff ..	President, medical officer, medical inspector, director laboratory, chemist, sanitary engineer, statistician, chief clerk, inspectors, clerks and laboratory assistants.	President, secretary, director, chief inspector, statistician, bacteriologist, chemist, sanitary engineer, 10 district inspectors, clerks, messengers.	Chief medical officer, clerical staff.	President, secretary, epidemiologist, statistician, chief clerk, bacteriologist.	Hospitals for feeble-minded and incurables. Commissioner public health, medical inspector, three sanitary inspectors, statistician, bacteriologist, clerical staff and laboratory assistants.	President, chief medical officer, sanitary engineer, bacteriologist, district medical inspectors, chief sanitary inspector, assisted by provincial police, and statistician and laboratory assistants.	President of board, chief medical officer, district medical officers, chief sanitary inspector, assisted by provincial police, and statistician and laboratory assistants.

*The figures for Saskatchewan are those of 1916.

