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Incidence of Tuberculosis in the Industrial Population*

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FOR a long time, it has been realized by those who have studied the tuberculosis problem that the disease is not uniformly distributed in the population as a cause of sickness and of death, but that it is concentrated in certain stratums and groups. In fact, the campaign to control the disease is more and more directing its attention to these classes and groups. Common observation and everyday experience have shown that tuberculosis is much more prevalent in the industrial population of the country than in the agricultural, the commercial, or in the professional trades. It is the purpose of this paper to point out certain variations in the tuberculosis death rate in the various elements which compose the industrial population. This should prove to be an important aid to the movement against tuberculosis, as it will show where the disease takes the heaviest toll of life, and where it is less prevalent. Such knowledge should make it possible to economize effort and to concentrate resources where they will do the most good.

By the industrial population I mean that large section of the people who live, for the most part, in the cities and towns, and who draw their support from employment in the industries of the country. They are, almost altogether, wage earners and their dependents, including women and children. I use this term "wage earners," knowing well its limitations, to identify the group I shall discuss with that large number of people who are insured in the industrial insurance companies of the country. I might have entitled this paper with more propriety, "The Incidence of Tuberculosis among Those Insured in the Industrial Department of the Metropolitan Life Insurance Company." The advantages gained by using this material are many. It covers a period of 20 years; relates to a population extending over the states and provinces of the United States and Canada; and includes millions of negroes as well as white persons—virtually all city dwellers who live on wages.

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Tuberculosis is primarily a disease of the working classes of the country. In 1930, for example, the death rate from all forms of tuberculous disease, among the industrial policy holders of the Metropolitan, was 81.3 per 100,000. In contrast, the death rate for the ordinary policy holders for that year was only 48.7 per 100,000.

These ordinary policy holders are persons who carry insurance ranging from a minimum of $1,000 up to hundreds of thousands of dollars. In the Metropolitan, a great many of the ordinary policy holders carry industrial insurance also. The ordinary department death rate for tuberculosis would be lower still if these were excluded. For example, among those who carry insurance in policies for $5,000 or more (among whom very few carry industrial insurance), the rate was only 17 per 100,000; and among the many employees of the company the rate was 40 per 100,000. It is clear, therefore, that the two main classes of the population are sufficiently far apart in their tuberculosis death rate to show how important is the industrial factor.

We may still further drive home this contrast by recording the fact that the death rate from tuberculosis in the general population of the U. S. Registration Area for the last year available, 1929, was 76 per 100,000 of population, as compared with 87 for wage earners and their dependents. But this figure (76) includes deaths from tuberculosis in the industrial population, as well as in all of the rest. If it were possible (which unfortunately it is not) to obtain the death rate from tuberculosis for the entire population, outside of the industrial class, the rate would be considerably lower than 76. A closer approximation, perhaps, to the tuberculosis death rate of the non-industrial population is the rate for 1929 for the rural area of the United States. That death rate was 74.7 per 100,000,* but even this figure is much higher than the true rate for actual, permanent residents of the rural districts, because it includes that large number of deaths of city residents who went to rural communities in search of health, and died there either in sanatoriums, hospitals, or in private homes.

There can be no question, in view of these figures, of the heavy concentration of tuberculosis as a cause of death in the urban industrial group of the population. Every refinement we could make, which would separate out those who work for salary, or on farms, from those who work for wages in industrial establishments, would make the distinction all the greater. I do not for a moment suggest that tuberculosis is not an important factor in the mortality of the farming population, or that it does not strike down others than the industrial workers in cities; but it does this more infrequently.

* When general population death rates for 1930 become available a still lower rate will be shown, and a greater contrast with the 1930 rate for the industrial policy holders, 81.3.

TABLE I

DEATH RATES PER 100,000 FROM TUBERCULOSIS—ALL FORMS. BY RACE, SEX AND AGE PERIODS. METROPOLITAN LIFE INSURANCE COMPANY, WEEKLY PREMIUM-PAYING INDUSTRIAL BUSINESS. 1911 TO 1930

Year	Tuberculosis—All Forms										
	One and Over	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 to 74
	White Males										
1930	68.0	21.7	8.6	7.9	34.3	80.2	100.6	141.0	177.2	172.2	151.2
1929	73.1	25.6	9.0	7.2	38.3	81.4	120.8	153.9	183.6	167.8	159.1
1927	77.9	29.7	10.0	9.2	44.2	85.4	129.9	167.4	191.0	174.9	153.1
1925	84.3	29.1	9.5	11.4	53.7	103.0	135.6	187.1	204.0	181.8	179.9
1923	97.9	37.2	13.6	11.1	52.9	130.3	169.3	202.5	225.5	206.7	201.7
1921	99.5	35.8	15.2	14.6	62.5	142.8	160.2	207.4	215.5	203.9	192.9
1919	145.2	57.8	19.0	17.4	90.0	153.9	240.4	352.4	353.1	271.2	242.5
1917	194.3	71.2	23.7	20.1	106.7	211.5	344.1	488.7	461.6	360.9	282.6
1915	201.1	68.7	28.0	15.8	91.7	218.8	359.4	517.6	456.7	356.4	262.9
1913	218.2	80.5	23.8	19.9	113.0	252.9	404.3	542.5	473.5	366.1	256.2
1911	230.8	75.6	27.8	21.4	115.9	288.6	424.1	606.1	455.5	392.8	303.6
	White Females										
1930	57.1	23.2	8.7	14.1	69.5	108.6	90.7	66.3	57.1	66.7	72.4
1929	63.0	28.0	8.1	14.4	70.8	130.9	105.3	71.6	61.0	66.3	81.2
1927	70.9	27.8	10.4	15.8	93.3	141.7	118.5	79.6	67.7	69.2	82.8
1925	76.7	30.3	12.5	18.1	92.9	155.4	130.3	92.7	70.9	74.7	81.1
1923	88.2	31.3	11.8	24.4	107.4	167.4	144.7	111.3	91.9	81.2	96.3
1921	95.2	36.8	14.8	28.4	118.9	186.9	151.8	118.6	90.9	87.9	106.2
1919	125.2	54.3	22.2	35.6	145.8	228.4	214.3	162.7	121.1	115.4	116.2
1917	135.0	69.4	24.5	38.8	160.0	238.0	220.0	180.6	134.9	128.7	117.9
1915	141.5	70.7	26.0	37.3	146.4	224.5	234.8	206.5	141.8	140.9	133.9
1913	147.7	88.1	29.8	39.7	144.5	230.0	247.7	214.0	151.0	136.4	154.6
1911	165.4	81.6	35.8	39.1	155.2	263.3	293.6	260.4	161.7	150.7	149.4
	Colored Males										
1930	223.8	97.2	51.1	73.3	245.4	351.5	295.1	258.7	275.8	204.4	229.8
1929	226.4	125.0	55.4	65.8	272.1	377.7	288.2	266.5	245.6	200.4	174.0
1927	227.6	129.6	55.7	65.4	273.0	341.5	273.2	290.7	251.5	212.7	191.7
1925	224.9	137.2	43.7	85.3	300.6	334.7	276.5	264.7	242.7	211.4	166.0
1923	242.9	139.2	86.0	76.2	285.3	362.3	314.7	286.3	261.3	204.2	206.1
1921	249.1	139.3	77.0	101.3	293.4	353.2	309.9	295.1	264.3	238.0	272.2
1919	319.7	203.8	102.7	177.7	339.2	435.4	388.9	392.5	351.9	289.4	317.1
1917	414.9	197.4	133.4	136.1	450.0	547.5	527.8	562.8	482.3	350.5	381.3
1915	432.8	217.8	134.0	140.1	389.6	532.8	583.6	608.4	436.2	486.6	357.0
1913	428.6	282.2	134.8	147.1	412.7	592.5	545.7	575.8	494.7	446.7	350.6
1911	422.2	345.5	175.4	151.8	416.2	610.6	548.8	488.6	478.2	465.6	364.4
	Colored Females										
1930	213.0	97.7	53.9	123.1	368.7	398.1	301.9	182.4	139.2	113.6	113.9
1929	220.1	126.0	66.2	125.6	383.7	432.0	293.1	194.9	149.0	100.8	84.0
1927	228.4	118.4	49.6	126.5	421.6	433.8	339.6	177.3	124.0	97.2	106.9
1925	228.0	116.0	56.2	154.4	431.4	421.2	301.8	184.5	134.1	116.0	99.5
1923	245.7	107.6	59.3	153.6	444.2	489.7	317.1	214.2	161.6	125.4	105.0
1921	285.8	133.4	74.2	205.1	474.4	622.4	374.6	214.7	178.1	137.0	123.1
1919	328.9	157.6	122.3	240.4	642.2	551.6	404.1	283.9	191.1	173.6	196.5
1917	371.7	231.1	163.7	291.3	660.7	587.5	479.4	332.0	213.8	176.7	189.7
1915	394.2	315.2	145.9	285.4	665.1	638.7	497.3	345.5	271.1	220.1	184.7
1913	363.1	313.0	132.7	243.2	601.5	612.1	443.0	366.2	187.8	159.8	194.3
1911	415.1	269.7	178.9	315.7	643.1	735.8	511.3	379.1	234.4	225.4	173.2

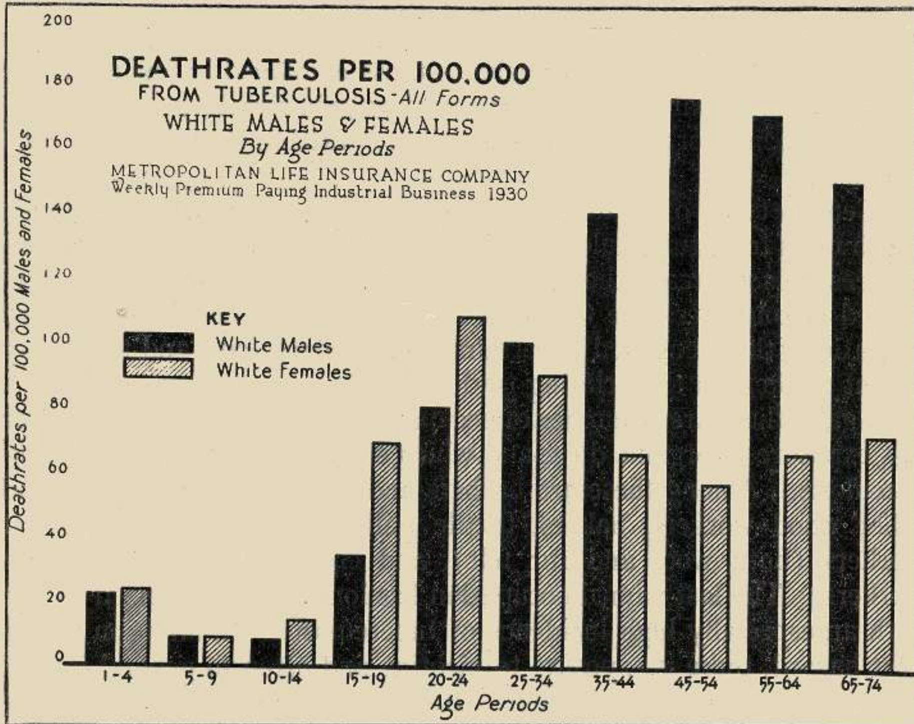
It is safe to say at this time that, by and large, tuberculosis is rapidly becoming a minor cause of death in all but the industrial classes of the population. We shall later call attention to a few apparent exceptions to this statement. But, to illustrate the essential truth of what I am saying, it is only necessary to note the tuberculosis death rates in 1929 of 27 for the State of Utah; 32 for Nebraska; 33 for Iowa; 34 for Wyoming; 35 for North Dakota; and 37 for Idaho and Kansas. In these states, there is a total population of 7,589,190, of whom about two-thirds (63.4 per cent) are rural dwellers, and only a small percentage may be classified as in the industrial population. In these states certainly it may be said that tuberculosis has already become a minor cause of death.

It would be misleading, however, if we did not call attention to the tremendous improvement that has occurred in the incidence of tuberculosis in the industrial population during the last 20 years. In fact, the improvement has been greater in the industrial classes than in the nation as a whole, or in any other major group of the population; for we find, as between 1911 and 1930, a decline in the mortality from tuberculosis of 64 per cent. In other words, for every 10 lives lost on account of tuberculosis in 1911, only 4 were lost in 1930. In the general population, the reduction in 1929, as compared with 1911, was only 52 per cent. Again, I wish it were possible to indicate the decline in other specific population groups, but the only other one for which data are available is a constantly increasing rural area, which between 1910 and 1929 shows a decline of 41 per cent. Obviously, the disease we are discussing was a much more important factor in the life of all elements of the population 20 years ago than it is now; but this applies particularly to the industrial classes. Yet tuberculosis is still the third cause of death in the industrial and the seventh in the general as well as in the rural population.

Within the industrial classification, the disease will be found concentrated primarily among males and among colored persons. Taking the figures for 1930 for insured white persons as our guide, we find no significant difference between the sexes under age 10. From ages 10 to 15, however, the mortality among females is higher by more than 75 per cent; and between 15 and 20 it is twice as high among white females as among males. Between 20 and 25, it is still 35 per cent higher among white females; but after age 25, the rate is uniformly lower among females; and at the age period 45 to 54 it is only one-third as high. Figure I* shows the relative importance of the disease

* The three charts used in this paper are similar in form to those prepared by Miss Jessamine S. Whitney, Statistician, National Tuberculosis Association, for her "Facts and Figures about Tuberculosis." The charts have been brought up to date.

FIGURE I



as a cause of death, in 1930, in the two sexes of the white classification.

Uniformly, the colored people show higher rates than the whites. At some of the younger ages, the rates for the colored are from 5 to 9 times as high as those for the whites, although after age 35 they are less than twice as high for males. Toward old age, the differences become less marked. Table I shows the contrast between white and colored persons on the basis of the 1930 mortality experience in the Metropolitan's industrial department.

With the colored, as with the white, there is substantially no difference under 10 years in the mortality rates of the sexes. Between 10 and 20 the rates for females run from 50 to nearly 70 per cent higher than for males, instead of 100 per cent higher, as they do in the case of the whites. With the colored, it is not until age 35 is reached that the death rate for males exceeds that of females, whereas this condition obtains from age 25 with the whites.

Occupation plays an important part in the incidence of tuberculosis and in its mortality. The very highest rates for the disease are found among those exposed to silica dust. Included here are a large number of workers in ore mills and mines (except coal mines), in the

building industries, and among grinders and buffers, stone workers, pottery workers, employees of foundries and other metal industries, and of the clay and glass industries. Another group having a high death rate from tuberculosis includes those employed in low grade occupations, more particularly common laborers in a variety of industries, longshoremen, porters, freight handlers, watchmen, hucksters, and peddlers.

Certain types of factory work have long been associated with high death rates from tuberculosis, although the mortality among these employees does not reach the figures for those exposed to silica dust. Included among these are the cigar and tobacco workers, shoe factory operatives, those engaged in certain textile occupations, and to a lesser extent workers in the printing trade.

Again, there are a number of occupations, in which there is more or less exposure to organic dust, and which show high mortality from tuberculosis. Among these are barbers and hairdressers, furniture and other wood workers, bakers, textile mill workers, hatters and hat workers (both wool and fur felt), and cigar makers and tobacco workers. The last named occupation has long been recognized as one with an especially high incidence of tuberculosis. In addition to the dust hazard, there is exposure to nicotine and often to general insanitary conditions in the workshops. But it is necessary to point out that in this industry wages are low, and the work attracts many men of poor physique and low resistance.

Another group in which tuberculosis takes a large death toll is laundry workers. This may be due, in part, to the fact that these workers are sometimes exposed to infected material; but the chief factor in their high mortality is probably the conditions of heat and humidity in which they work.

There are other employments in which there is a relatively high incidence of tuberculosis, although they are not associated with any definite industrial risk. Among these are tailors and other clothing workers, cobblers, and slaughter and packing house employees. Clerical workers and bookkeepers also have a higher than average incidence. Here the factors of confinement, poor ventilation, and fatigue, undoubtedly play their part in reducing resistance to infection.

This paper should not close without a brief reference to the geographical aspects of the mortality from tuberculosis. For this purpose I shall have to use data for the general population, even though this paper's title would seem to restrict my discussion to the industrial population. I have already referred to the extremely low mortality in the general population for certain states with predominantly rural,

and non-industrial populations, in order to contrast their low tuberculosis death rates with those of states where the people are more or less concentrated in the cities—and are largely wage earners.

First of all, it will be necessary to disregard the figures for certain states, like California, Colorado, New Mexico, and Arizona, which have very high tuberculosis death rates, solely because thousands of tuberculous people go there every year in the hope that favorable climatic conditions will arrest the disease. Many of these people die each year and thus swell the mortality rates for these states to a point many times in excess of the figure for the permanent residents. There are, however, 4 states where the ravages of tuberculosis are worse than in any others, namely, Tennessee, Kentucky, Maryland, and Virginia. This applies, with the exception of Virginia, to both the white and colored populations. Aside from these states, the following (in addition to the "cure seeker" states) have tuberculosis death rates in excess of the average: Alabama, Arkansas, Delaware, Louisiana, Mississippi, Nevada, North Carolina, and South Carolina.

FIGURE II

DEATHRATES FROM TUBERCULOSIS - ALL FORMS

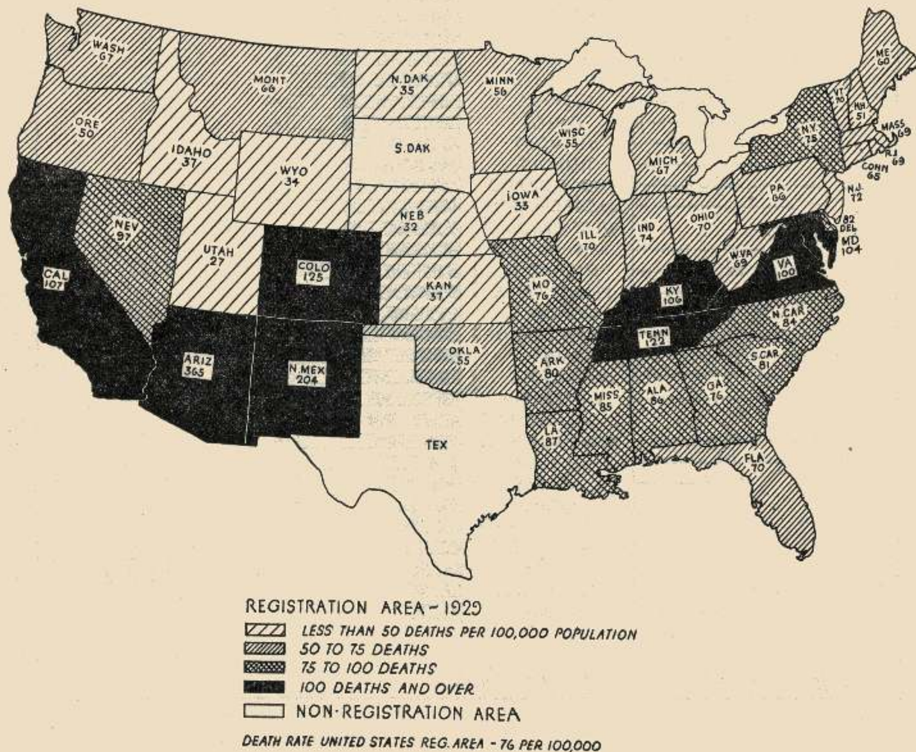
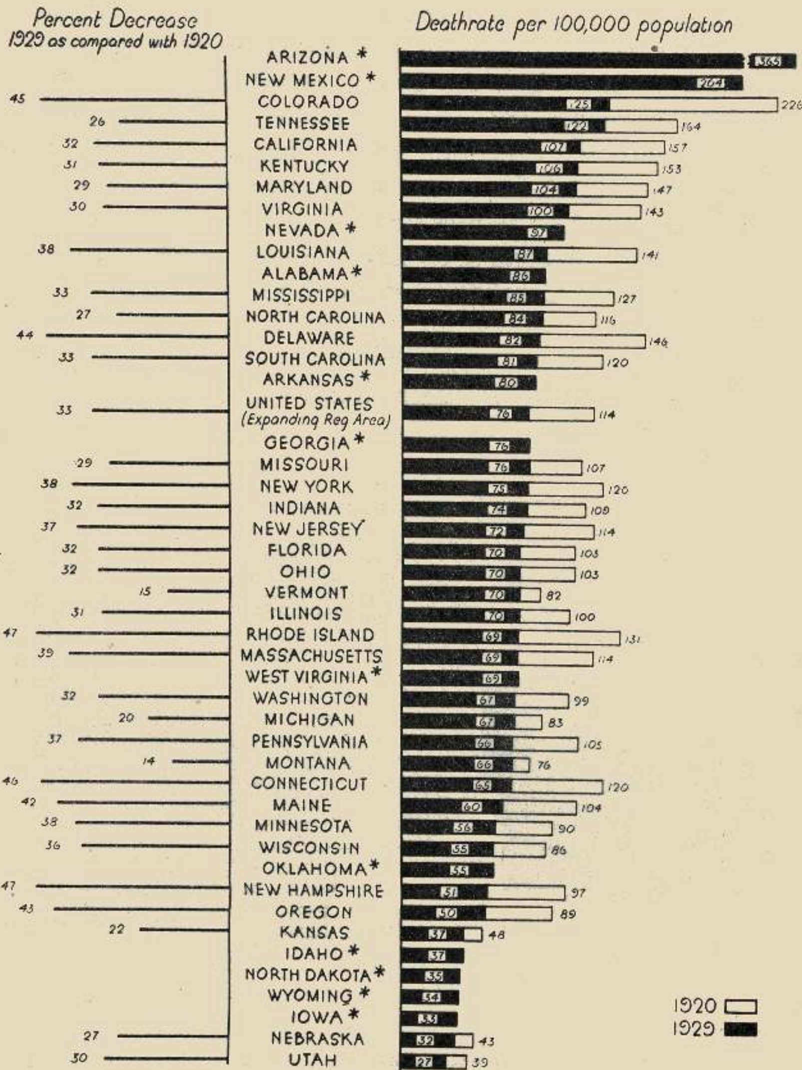


FIGURE III



Figures II and III show graphically the tuberculosis mortality rates in the several states, in 1929, together with the per cent decline in that year, as compared with 1920 for each state. The map shows the 8 "black spots," states in which the tuberculosis death rate in 1929 ranged from 100 per 100,000 up. As noted previously, the high mortality in Arizona, New Mexico, Colorado, and California is due to deaths of non-residents, and the most serious situation prevails in Tennessee, Kentucky, Maryland, and Virginia. In the last named, the tuberculosis death rate among the white population is not far from the average figure for whites in the United States. Negroes, however, constitute 27 per cent of Virginia's population; and their excessive mortality from tuberculosis raises the death rate for the state to one of the highest figures in the entire country. In Maryland, too, the problem is largely with the negroes, although the mortality from tuberculosis among the whites is also above the average.

If it were possible to obtain resident death rates for tuberculosis for each of the states the shadings in the map would be changed in several instances. I strongly suspect, for example, that the figures for Nevada and North Carolina would be materially lower if deaths of non-residents were excluded.

In Figure III, attention is directed in particular to the per cent declines for the several states. It is encouraging to note that no state fails to show a lower tuberculosis death rate in 1929 than in 1920; but one is immediately impressed with the fact that for each of the 4 states where the situation is the gravest, the drop in the death rate has been less than the average decrease in the United States (expanding registration area).

Large cities whose tuberculosis mortality in 1929 was in excess of the average for all cities in the registration states, considered as a group, are: Albany, Atlanta, Baltimore, Birmingham, Boston, Buffalo, Chattanooga, Cincinnati (very high), Cleveland, Columbus, Denver (due entirely to tubercular transients from other states), Detroit, Duluth, El Paso (for the same reason as Denver), Fall River, Houston, Indianapolis, Jacksonville, Kansas City, Kansas, Kansas City, Missouri, Knoxville, Los Angeles (for the same reason as Denver), Memphis (very high), Nashville (very high), Newark, New Bedford, New Orleans (very high), Manhattan and Richmond Boroughs of New York City, Norfolk, Philadelphia, Richmond, San Diego, St. Louis, San Antonio (very high—probably from non-resident deaths), San Francisco, Scranton, Toledo, Trenton, Washington (due to an extremely high rate among negroes—the mortality is not high among whites), and Worcester.

I have, also, comparable data to show the relative mortality from tuberculosis among the insured Canadian wage earning population, as compared with the death rate in the same group in the United States. The figures for Canada are based upon the mortality experience of about 1¼ millions of industrial policy holders of the Metropolitan Life Insurance Company. They relate to a period of 6 years.

TABLE II

DEATH RATES PER 100,000 FROM TUBERCULOSIS (ALL FORMS) AMONG INDUSTRIAL POLICY HOLDERS IN THE UNITED STATES AND CANADA COMPARED

Year	Death Rates per 100,000			Per cent Excess Canada over United States (White)
	United States		Canada (Total Persons)	
	Total Persons	White		
1930	79.7	59.0	97.3	64.9
1929	86.2	64.9	96.8	49.2
1928	89.8	68.4	94.3	37.9
1927	93.0	71.7	100.9	40.7
1926	98.8	77.6	102.5	32.1
1925	97.7	78.4	104.1	32.8

It will be seen, first of all, that the tuberculosis death rate runs uniformly higher in Canada. Furthermore, the decline has been small in recent years, by no means matching the improvement in the United States. Even when we include the mortality among almost 2½ millions of negro policy holders (as we do in the first column of this table), the Canadian death rate exceeds that for the United States; and it must be borne in mind that the tuberculosis mortality rate for negroes runs about three and one-half times that for the whites. As the Metropolitan has comparatively no negroes at risk in Canada, the really significant comparison is that with the insured whites in the United States. There is a wide gap between the Canadian and United States figures. As a matter of fact, with the slow decline in Canada and the abrupt drop in the United States the excess in the Canadian tuberculosis death rate is becoming greater every year. These figures, it must be remembered, relate almost exclusively to city dwellers. Canada's relatively unfavorable record is due entirely to the very high death rates in the industrial populations of the *cities* in Quebec, Nova Scotia, and New Brunswick. For the remaining five provinces, the mortality from this disease is well below the average for white wage earners in the United States.

On what elements of the population, then, should the attack on tuberculosis be concentrated from now on? First of all, upon the wage

earners in American and Canadian industries, and their dependents. In this group, despite the splendid progress that has been made, tuberculosis still ranks third among the causes of death. Thus, where the greatest progress has been made lies a great opportunity for further progress. Within this wage earning element, the concentration should be primarily on males, except between the ages of 10 and 25, where the mortality among females runs from 14 per cent to more than 100 per cent higher. Second, upon the negroes, both in the industrial and general population, where the reduction in the mortality rate has by no means kept pace with that among the whites—more especially within the last 10 years. Here probably lies the greatest opportunity of all, especially in the age groups under 25, where the negro death rate exceeds the white by from four- to almost ten-fold. Third (and this lies within the field of the industrial hygienist), among those engaged in the several occupations I have mentioned—more particularly among those exposed to silica dust. Fourth, in the general population, both white and colored, of Tennessee and Kentucky, and to a lesser extent in other states, mostly in the South, where the tuberculosis death rate runs above the average; also among the populations of over 30 cities. Fifth, among industrial wage workers and their dependents in the cities of the Canadian provinces of Quebec, Nova Scotia, and New Brunswick.

There is every reason to believe that if the health officers and health agencies of the United States and Canada would concentrate their efforts on these groups of the population, a very definite reduction in both cases and deaths would result. Up to the present time, even lacking such particular concentration of effort, the death rate has declined each year among the industrial population. It should be possible, without undue expenditures of money, to increase the rate of decline. The important thing to do is to concentrate the energy and intelligence of the medical and public health services of the communities along the lines I have indicated. The immediate goal of the tuberculosis movement should be to accomplish for the industrial population what has apparently been brought to pass for those who are somewhat more advantageously placed socially and economically. This can and will be done.