billion ounces of silver were shipped from Bolivia in the colonial period, netted from the labors of the Indians "who went off to meet a certain death in the dark wet pits and galleries. . . . The destruction of life was frightful, the official returns made by the officials charged with the impressment demonstrating that in the neighborhood of Potosí the Indian population fell in one hundred years to one-tenth of its original number" (Thomas C. Dawson [8], formerly United States Minister to Santo Domingo).

In the Caribbean Islands the decline of man power for labor was met in the worst possible way, from an epidemiological standpoint, by the introduction of Negro slaves from Africa, a primitive race, inexperienced with tuberculosis and other contagious disease. If we can assume that tuberculosis was already widespread among the Indians, we may also assume that it was rapidly passed on to the new arrivals. The tuberculosis of the Caribbean today is almost certainly the legacy of a disease incidence of epidemic character in colonial times.

## TUBERCULOSIS IN NEGROES

We have mentioned the Negro influx in the West Indies. Let us now examine the condition of the Negro in the United States. According to many writers the Negroes in the United States did not have much tuberculosis until forced to shift for themselves after the Civil War. "There is no fact more fully established in the minds of the oldest physicians of the South, than that consumption prior to emancipation, was an exceedingly rare disease among the Negroes", wrote one Southern physician (J. F. Miller [9]).

The figures from Charleston, South Carolina, attest to the inaccuracy of this view, however. In this city, with a high colored population, a practically unbroken series of mortality statistics are available from 1822. While these figures lack the accuracy of modern data on tuberculosis, they probably represent a fair approximation. At the Sixth International Congress on Tuberculosis held in Washington in 1908, Dr. Robert Wilson [10] of Charleston presented an analysis of data on white and colored mortality from tuberculosis in his city, which showed that contrary to current opinion tuberculosis was by no means a rare disease among the Negroes before the Civil War, and that it was approximately as common a

cause of death as among the whites. Two interesting drops in mortality are apparent in his charts. In the third decade of the century the rate is given as 458 per 100,000. In the two succeeding decades a marked drop took place which is coincident with a drop in the total Negro population and has been attributed to the improvement in living conditions resulting from the less crowded state. In the decade from 1851–1860, a rise was again apparent, 381 being given as the city rate. Following the war a further rise took place, which continued to a peak of 927 per 100,000 in 1885. After this a slow decline took place, the rate finally reaching about 500 per 100,000 in 1910, and continuing on downward.

These figures probably represent fairly well the main trends in Southern cities. The early high rate was the typical situation of the active slave trading days. The explanation for the early high rate is probably the same as that which I shall give presently for the African troops arriving in France in the World War. With periods of hygienic improvement, such as occurred in Charleston from 1830–50, an improvement might generally be expected to take place, as it did in Charleston. Probably in all cities, just as in Charleston, a big rise followed the Civil War, traceable easily to the complete upset in the Negro's life and his inability to cope successfully with his economic conditions. In the final decade of the century his rate was again dropping, and since then it has continued to drop in the same manner as the white mortality rate, but with slower speed.

It has often been assumed that the Negro in the Northern cities today could lay his high tuberculosis death rate to massive infection of virgin soil. He was supposed to have come north in the uninfected state from the rural South and to have fallen prey to progressive primary infection. But the facts are all against this hypothesis. The Charleston figures I have just quoted indicate that the Negro has been heavily tuberculized for a century. The figures are for an urban population, but the rate is so high that with even a small amount of exchange between urban and plantation population, the opportunity for infecting the latter must have been considerable.

The high rate of the Negro in the cities of Northern United States is doubtless not the result of a single circumstance. Environmental as well as racial factors play a part. Cer-

tainly, however, it cannot be attributed to lack of childhood infection comparable to that occurring in the whites. In a survey of the incidence of tuberculous infection, as determined by the tuberculin reaction, in several widely separated rural communities in the South, Aronson [11] found a high incidence of positive reaction among the Negroes, not greatly different from that obtaining in Philadelphia.

Such differences as exist in Negro tuberculosis mortality in the rural South and the industrialized Northern cities, are not to be explained on the basis of virgin soil infection. In recent years we have seen two important reports on the tuberculosis of African blacks that should help us to an understanding of our own problem. During the Great War large numbers of Senegalese troops arrived in France, meeting what was for most of them their first contact with tuberculosis. Only four or five per cent reacted positively to tuberculin on arrival. A fulminant epidemic of tuberculosis developed among them, and the disease tended to progress to the generalized form with high and rapid mortality (Borrel [12]). This was typical "tuberculosis of virgin soil". It is not the type of tuberculosis from which the colored population of America are suffering today. In all probability, however, the first Negroes introduced in the Americas, who were presumably free from tuberculosis on leaving their native shores, underwent this fate when they met the conditions of crowding, servitude and excessive labor of some of the early island and continental colonies. It is altogether probable that the disease was acutely epidemic before it became chronically endemic, just as in the case of the Canadian Indians that I have described.

The other of the two recent reports to which I have made reference, is that of the Tuberculosis Research Committee of the South African Institute for Medical Research [13]. In it is detailed an extraordinarily exhaustive inquiry into the reasons for the high tuberculosis mortality of the blacks employed in the mines on the Rand. In this case it is clearly shown that the entering native laborers are already heavily tuberculized on arrival, 70 per cent or more reacting positively to tuberculin. Their tuberculosis, while frequently massive in character, cannot be on the same basis as that of the Senegalese troops. The final conclusion of the investigating committee was that it is largely the result of activa-

tion of old infections brought about by the heavy labor of the Rand, coupled with frequent superinfections due to living conditions, and intensified in the long-service workers by the advent of silicosis.

This is more nearly comparable to the situation of Negroes in the North today. They have lived in the rural south, not free from tuberculous infection, but under better living conditions than in the North. In the North, on the other hand, they have been crowded, have lived badly, and been subjected to severe economic stringency. Such conditions in this race make for massive contagion. Opie [14] and his associates have shown that Negro patients in Philadelphia and in Jamaica tend to put out much greater numbers of tubercle bacilli in the sputum than white patients, and therefore create in their environment more opportunity for massive infection. Obviously the Negro problem needs special attention, as Landis [15] pointed out some years ago, and an active and effective program of prevention of tuberculosis in the Negro is indeed now well under way in the various States.

Table III illustrates the trend of tuberculosis in the white and Negro population of two large cities, Philadelphia and Chicago, from 1900 to 1930. The excessive rate in the colored population is apparent, and it is evident, too, that the steady drop in mortality is not occurring so rapidly in the Negroes as in the whites.

### THE DECLINE OF TUBERCULOSIS IN OTHER GROUPS

In table IV are indicated for comparison the total tuberculosis rates for the registered area of the United States for the years 1930, 1931 and 1932. The rate for 1933 is not yet available, but the indications are that it will be lower than that of 1932. Dublin [16] has published provisional figures for 1933, indicating a further decline, and notes that "it has extended to all economic strata of the population and more particularly to industrial wage earners where the situation in the past was gravest."

The figures just quoted illustrate the decline to which I made reference in my opening remarks. Their trend is so obvious that we may with good reason look forward to a still more happy situation in the future. It must not be forgotten, however, that the notable decline in the United States in recent years has been the result of an intensive campaign for

the eradication of tuberculosis. As I have attempted to make clear [17], prevention of infection has become the basic effort in this campaign. It may be asked if the success of this effort is shown by the curves of reaction to tuberculin as well as by those of mortality. A systematic study of this subject has not yet been made. It awaits the general usage of a standard tuberculin, which, as I have indicated [17], may be expected shortly.

TABLE III

TUBERCULOSIS DEATH RATES BY COLOR IN PHILADELPHIA AND CHICAGO 1900, 1910, 1920 AND 1930

| Populations | Total | | White | | Colored | |
|---|---|---|---|---|---|---|
| | Population at time of Census | Tuberculosis death rate | Population at time of Census | Tuberculosis death rate | Population at time of Census | Tuberculosis death rate |
| **Philadelphia** | | | | | | |
| 1930 | 1,905,961 | 81.4[3] | 1,728,457 | 58.7[1] | 222,504 | 256.0[3] |
| 1920 | 1,823,779 | 137.3[1] | 1,688,180 | 118.7[1] | 135,599 | 366.2[1] |
| 1910 | 1,549,008 | 216.8[1] | 1,463,371 | 193.7[1] | 85,637 | 607.8[1] |
| 1900 | 1,293,697 | 239.6[2] | 1,229,673 | [5] | 64,024 | [5] |
| **Chicago** | | | | | | |
| 1930 | 3,376,438 | 65.9[4] | 3,117,731 | 48.9[4] | 258,707 | 268.8[4] |
| 1920 | 2,701,705 | 97.4[1] | 2,589,169 | 87.5[1] | 112,536 | 319.9[1] |
| 1910 | 2,185,283 | 177.9[1] | 2,139,057 | 169.8[1] | 46,226 | 543.6[1] |
| 1900 | 1,698,575 | 184.6[2] | 1,667,140 | [5] | 31,435 | [5] |

[1] U. S. Bureau of Census MORTALITY RATES, 1910-1920
[2] U. S. Bureau of Census MORTALITY STATISTICS, 1900-1904
[3] Philadelphia Division of Vital Statistics
[4] Chicago Health Department
[5] Data not available

TABLE IV

TUBERCULOSIS DEATHS AND DEATH RATES IN THE REGISTRATION AREA IN CONTINENTAL UNITED STATES[1] 1930, 1931 AND 1932

| Year | Number of deaths | Rate per 100,000 population |
|---|---|---|
| 1932 | 75,398 | 63.0 |
| 1931 | 81,280 | 68.4 |
| 1930 | 84,595 | 71.7 |

[1] Source: U. S. Census Bureau. Mortality Statistics in the Death Registration Area of Continental United States, 1930 1931, and 1932. New Release of September 28, 1933.

Numerous data of value, however, have been assembled in recent months. Some of the best of these come from

schools and colleges. I shall quote those from the latter group, which indicate a much lower infection incidence in the middle and western than in the eastern parts of the United States.

At the University of Pennsylvania, as I am informed by Dr. Lees, the freshman class averages an incidence of positive reaction to tuberculin, of about 60 per cent. Among the freshmen at Haverford College nearby, the incidence, as determined by Drs. Aronson, Seibert and myself, was 70 per cent. At Yale, Soper has reported an incidence of 60 per cent for the freshman. At the University of Minnesota, in contrast, Myers [18] has recently reported an incidence of 33 per cent for freshmen, and Dr. Stiehm has sent me data from the University of Wisconsin which show that the incidence of reaction to tuberculin ranges from 22 to 33 per cent for age groups from 17 to 22 in the whole student body. Medical students, averaging about four years older, averaged an incidence of 45 per cent positive at Wisconsin. In 1931 Hetherington, McPhedran, Landis and Opie [19] reported an incidence of 80 per cent positive for medical students at the University of Pennsylvania.

Unfortunately careful examinations have not been made for a long enough period to prove that in the communities with the lower indices of positive reaction the incidence is on a dropping curve. It seems clear, however, that the youth of the East is more heavily tuberculized than that of the Middle West. The mortality rates show a similar divergence. For 1932 in the two states on which I have commented particularly, Pennsylvania and Wisconsin, the rates are respectively 55.5 and 46.3 per 100,000. One must be cautious, however, in using mortality statistics, as tuberculous patients are prone to migrate, dying in other states than those of the onset of the disease.

Putting all facts together, it seems reasonable to predict that, barring unforseen catastrophes, the rate in the United States will continue to drop and that the Middle West and West will clear their native population of tuberculosis before the more densely populated East. It would seem, furthermore, that the methods in operation for the control of tuberculosis at present would continue to hold the disease in check in the face of any difficulties that may be anticipated at present.

In closing, I wish to refer briefly to the tuberculosis situation in the Latin American countries. In many the mortality rates are inordinately high as compared with the United States, and even increasing. In others vital statistics are admittedly not of sufficient accuracy to permit a comparison. It is equally true, however, that no one of these countries is so fortunately situated as respects the means of prevention as the United States.

The evolution of the present relatively favorable state of the United States is clear. Five decades ago its mortality rate was quite like that of Latin America today. In the succeeding years a period of industrial improvement and hygienic betterment induced a considerable drop. In more recent years this favorable trend has been accelerated by an intensive antituberculosis campaign, which has been carried out with great cost, but with equal success, through funds supplied by the people themselves through their contributions to the National Tuberculosis Association in the purchase of Christmas Seals, and through taxes going directly to state-supported institutions.

The way seems perfectly clear. The mechanism for the control of tuberculosis is understood. In the same general form as in the United States, with modifications to suit each local situation, it is proving effective throughout much of the world today. Admittedly the cost is great. But the chief requirement is an enroused public interest, and it is highly gratifying to see this public interest rising throughout the Americas.

## SUMMARY

In the United States the rate of tuberculosis mortality was probably low during the years of sparse settling, but it increased rapidly with urbanization and rose to great heights with industrial expansion and lowering of standards of living. The present decline of tuberculosis in both the United States and Europe set in when industry improved standards of living. The continuation of this decline to the present low levels is in large part directly due to the antituberculosis campaign, vigorously pursued in many of the world's nations.

The rise and fall of tuberculosis have been observed in rapid course in the last half century in the American Indians.

The extermination of game on the prairies brought large groups of North American Indians, practically free from tuberculosis, into crowded quarters on the reservations, where the disease attained a tremendous mortality. With elimination of the more susceptible stock, improvement in living conditions, and, finally, direct antituberculosis efforts, the severity of the disease in this group has been considerably mitigated. Presumably analogous changes have taken place among other American Indians.

Tuberculosis among the Negroes of the United States rose from an already serious extent to a peak of high mortality after the Civil War and has again declined in recent years. The mortality rate is still about four times the white rate in North American cities, and the favorable trend is progressing more slowly. The tuberculosis of the North American Negro is not the much discussed "tuberculosis of virgin soil". The Negro race is heavily tuberculized in the childhood age in its native environment in the Southern States, and the high mortality of Negroes in the North is probably the result of racial hereditary factors and poor conditions of living, and not the result of progressive primary infection.

The extraordinary reduction in tuberculosis mortality in the United States depends for its continuation on the present-day campaign for prevention of infection. The infection incidence, as shown by the tuberculin reaction, is much lower in the western than the eastern states. The infection incidence and mortality correspond in the different parts of the country, although not in parallel fashion. The evidence suggests that the West will clear itself of tuberculosis before the East.

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