SOME RESULTS OF TUBERCULOSIS ADMINISTRATION IN CATTARAUGUS COUNTY, NEW YORK

A summary of a study made by the Division of Research of the Milbank Memorial Fund[1]

IN attempting to make a statistical appraisal of the results of anti-tuberculosis activities in Cattaraugus County, two important considerations were kept in mind.

The first is that the full effects of most social experiments will not be manifested until considerable time has elapsed. This period of time must be thought of in terms of decades and even of generations rather than of years.

The second consideration is that anti-tuberculosis work, although having the single objective of reducing the prevalence of the disease, comprises a number of activities having varied objectives. These include efforts to prevent minimal tuberculosis; to prevent the development of minimal cases to more serious stages; to arrest advanced cases; and to arouse the community to its responsibility in keeping the arrested cases well.

With these points in mind, an attempt was made to see what measurable results have been attained so far by anti-tuberculosis activities in Cattaraugus County, in terms of case finding, supervision of active cases, and the fatality and mortality rates from the disease.

By way of orientation, it may be pointed out briefly that Cattaraugus County, having a population of approximately 74,000,[2] has had a relatively low death rate from tuberculosis over a long period of time. In 1880 and 1890

[1]The full report will be published in a forthcoming issue of the *American Review of Tuberculosis* and in somewhat briefer form in *Tubercle* (London).

[2]Excluding Indian population estimated as 1,000. Census enumeration showed the Indian population 1,162 in 1920 (XX Census Volume III: 678) and 927 in 1925 (State Census enumeration, 1925).

the death rates from "consumption" were 132 and 108 per 100,000 population respectively.[3] From 1900 to 1923 the tuberculosis mortality declined only slightly with annual rates varying from 85 to 60 per 100,000.[4] A further reduction of the mortality in an area where the tuberculosis death rate was already relatively low becomes an experiment of unusual interest.

Prior to 1923, the anti-tuberculosis work in the County was more developed than in most rural counties. The Cattaraugus County Tuberculosis and Public Health Association was started in 1909 and the county sanatorium was opened in 1916. The superintendent of the county sanatorium conducted clinics at various points in the County and was aided by the tuberculosis nurse and volunteer workers. The annual report of the county nurse for 1920 and 1921 showed an average of 52 clinics held with a total attendance of 235.

The County Bureau of Tuberculosis was organized in 1923 and initiated a program which placed especial emphasis upon (1) an intensive search for cases, (2) supervision of cases with the aid of public health nurses, and (3) education stressing the importance of early diagnosis and sanatorium care. The personnel for carrying out the initial program consisted of a medical director, an assistant medical director, a supervising nurse, and the part-time aid of 12 public health nurses.

I. The Discovery of Cases[5]

Prior to the establishment of the County Tuberculosis Bureau in 1923 the reported cases were only slightly in excess of the deaths each year; since 1924 the number of new cases

[3]Data obtained from U. S. Census 1880, Vol. XII.
U. S. Census 1890, Part IV.

[4]The experience of Cattaraugus in respect to a low death rate from tuberculosis is not unlike that of one or two other rural counties in New York.

[5]All of the data for both cases and deaths presented in this study are exclusive of Indians and of non-residents at the J. N. Adam Memorial Hospital (Buffalo Municipal Sanatorium located in Cattaraugus County).

reported has been on a level of approximately 115 annually, or about four cases to one death.

Records of the annual number of cases, classifiable according to age, form, stage and activity, if comparable from year to year, are pertinent data upon which to base some judgment of the success of case-finding activities. Unfortunately this essential comparability of record in the Cattaraugus County experience is lacking, with the exception of active cases in recent years. In 1924 and 1925 a large number of cases were reported which reflected the results of a round-up; the great majority of these were not diagnosed as active but were chiefly cases whose activity was not recorded. With such a large proportion (48 per cent in 1924) not diagnosed from the point of view of activity, any comparison of the annual distribution of the new cases according to activity obviously would be open to question.

In fact, it appeared that in the course of an intensive case-hunting campaign there was a tendency to make diagnoses of tuberculosis without sufficient anatomical or clinical evidence of disease. A partial review of the cases on the roster in 1930[6] indicated that the diagnosis of tuberculosis in the earlier years of the demonstration had been too liberal, so far as cases originally classified as arrested were concerned.

II. Results of Supervision of Active Cases[7]

The active cases of tuberculosis (all forms) under super-

[6]When Professor C.-E. A. Winslow, of Yale University, undertook a general review of the public health developments in Cattaraugus County the question was again raised by Dr. Herbert R. Edwards who was associated with Professor Winslow on the tuberculosis phases of the review. As the result, Dr. Edwards and Dr. John H. Korns, director of the Bureau of Tuberculosis of the Cattaraugus County Department of Health, undertook a review of the 1930 roster of cases, with such evidence as the records, clinical and other, afforded.

[7]The comments on active cases are based on the records of active cases after eliminating those cases whose diagnosis was "reversed" by Doctors Korns and Edwards in their review of the roster already referred to. The proportion of cases originally classified as active and reviewed whose diagnosis was "reversed" was relatively small, an "error" of only 5 per cent being indicated.

Year	Total Active Cases	No Change	Quiescent	Arrested or Apparently Arrested	Died		In Addition the Number Moved Away
					Tuberculosis	Other Causes	
			Number				
1922	22	9	0	0	13	0	0
1923	43	18	0	2	22	1	2
1924	73	37	5	7	24	0	3
1925	106	56	6	28	16	0	12
1926	151	65	29	31	23	3	8
1927	168	62	34	51	19	2	12
1928	138	46	18	46	24	4	17
1929	125	46	25	35	18	1	12
			Per Cent				
1922	100.0	40.9	0	0	59.1	0	
1923	100.1	41.9	0	4.7	51.2	2.3	
1924	100.0	50.7	6.8	9.6	32.9	0	
1925	100.0	52.8	5.7	26.4	15.1	0	
1926	99.9	43.0	19.2	20.5	15.2	2.0	
1927	100.0	36.9	20.2	30.4	11.3	1.2	
1928	99.9	33.3	13.0	33.3	17.4	2.9	
1929	100.0	36.8	20.0	28.0	14.4	.8	

Change in the condition of all known active cases of tuberculosis as of January first each year in Cattaraugus County, 1922-1929. (All these cases had been under supervision four months or longer.)

vision, shown in the accompanying table, classified as active at or as near as possible to the beginning of each year, have been tabulated according to the change occurring during the year, that is, as to whether the case became quiescent, arrested, or died, or underwent no change in the opinion of the diagnostician. Obviously the larger the proportion becoming arrested and the smaller the proportion dying within the year, the more effective has been the treatment of these cases.[8] In

[8]Provided, of course, that no radical change was made in the standards of diagnosis and classification. In this instance, it does not appear that any such change occurred so far as active cases are concerned; any slight changes could not have affected the results materially.

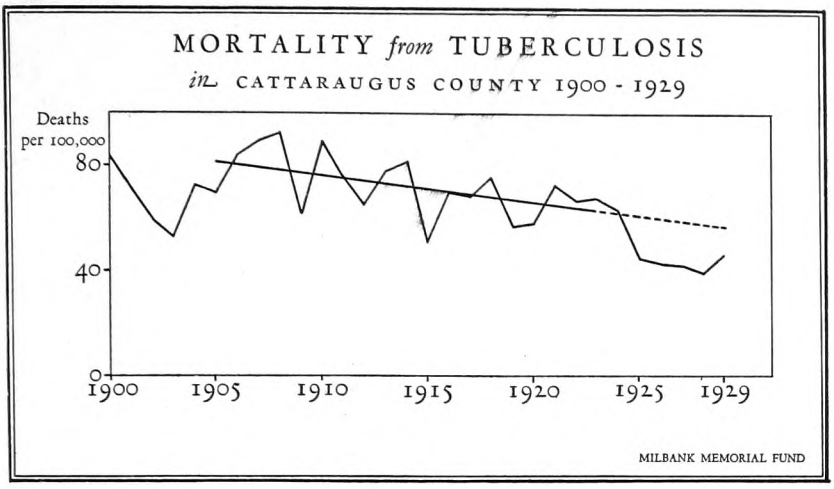


Fig. 1. Deaths from tuberculosis, all forms, per 100,000 population, in Cattaraugus County, 1900-1929. In the diagram, the trend is shown for the annual rates for the period 1905-1922.

1922 and 1923 half of the known active cases died before December 31st, while since 1925 the proportion dying within the year has averaged only 15 per cent. The proportion of cases in which activity ceased within the year has increased from 5 per cent in 1923 to an average of 30 per cent in 1927-1929. Since 1924 a third of the active cases in each year had some sanatorium care.

It is a well known fact that the effectiveness of treatment and supervision of active tuberculosis cases is greatly influenced by the stage of the disease at the time the case is diagnosed. A tabulation of the active cases of adult pulmonary tuberculosis shows the following: (1) the proportion of minimal active cases known in each year has increased from 14 per cent in 1923 to an average of 27 per cent in 1927-1929; (2) more than half of the active cases were classified as advanced in 1922 and 1923 while in the last three years the proportion has been from 20 to 24 per cent; (3) from 50 to 58 per cent of the active cases in each year have been classified as moderately advanced.

The foregoing paragraphs indicate clearly the favorable effects of improved supervision upon the progress of the case as well as upon the mortality. However, the factor of late reporting of cases tends to oppose these results. From six to eleven deaths in each year, during the period 1926-1929, were not known of *as cases* until after receipt of the death certificate, and from five to ten cases were known less than six months before death.[9]

III. Changes in Tuberculosis Mortality

The foregoing discussion of the records of case supervision pointed definitely to a reduction in the fatality of a considerable number of active cases. Obviously this ought to be reflected in the death rate. Such a result is indicated by a change in mortality in the period 1925-1929 from the previous trend as portrayed in Fig. 1. The significance of the decline in tuberculosis mortality in Cattaraugus County in the years 1925, 1926 and 1927, already has been discussed[10] and the mortality experience of 1928 and 1929 has not materially changed the general indications.

If no change in the trend of tuberculosis mortality had occurred subsequent to 1923, we would expect the trend values to decline from 61.2 ± 9.9 in 1925 to 57.1 ± 9.9 in 1929. The actual rates (45.3, 43.7, 42.1, 39.1 and 46.9) from 1925 to 1929 were from 10 to 33 per cent below the expected trend values. Applying the theory of probability to such a problem as this, the occurrence of five successive rates as low

[9]It is fair to point out that from one to three deaths each year (1926-1929) were of non-residents with advanced active disease who were in the County less than four months.

[10]Sydenstricker, Edgar: The Decline in the Tuberculosis Death Rate in Cattaraugus County, Milbank Memorial Fund *Quarterly Bulletin*, April, 1928.

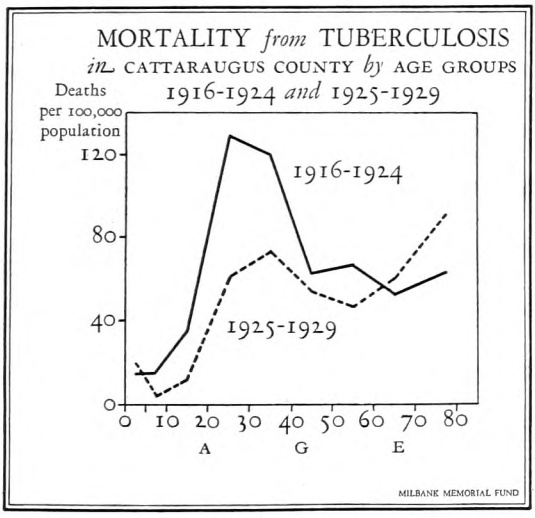
See also comments on Tuberculosis Mortality in the Milbank Memorial Fund's *Annual Reports* for 1926, pp. 77-80; 1927, pp. 51-55; 1928, pp. 58-64.

The occurrence of changes in economic conditions is discussed in the Milbank Memorial Fund's *Annual Report* for 1928, pp. 62 and 63. Close association of variations in tuberculosis mortality and in prosperity cannot be predicated in a rural community such as Cattaraugus County.

as these may be judged as a significant event in the history of tuberculosis in Cattaraugus County. The chances against its occurrence under the same conditions that prevailed in 1905-1923 would be considerably more than one million to one.

Of greater significance than purely statistical tests of the deviation of the actual rate from a predicted trend is the fact that the decrease in the Cattaraugus County tuberculosis death rate has taken place in the younger ages. This fact is clearly indicated by Fig. 2 which compares the mean annual rates for 1916-1924 with those for 1925-1929 at different ages. The rate among children under five years of age is slightly higher in the later period, but the numbers of deaths involved at this age are very few, averaging one per year in the earlier period and slightly more than one in the later period, and the change can hardly be considered significant. On the other hand, a very marked improvement in the mortality of children and adolescents has taken place, the decrease at ages 5-9 being 81 per cent and at ages 10-19, 69 per cent. The percentage decrease of 53 in the age period 20-29 is especially significant since at these ages the mortality reached its maximum in the previous period.

Fig. 2. Deaths from tuberculosis, all forms, per 100,000 population, by age groups in Cattaraugus County, in 1916-1924 and in 1925-1928.



The validity of the officially recorded tuberculosis death rate is discussed in some detail in the report. Although complete correction for residence by Dr. Joseph V. DePorte, director of the Division of Vital Statistics of the New York State Department of Health, for recent years indicated that the rate as corrected for this study was not appreciably affected, it was found that the recorded mortality has been somewhat exaggerated by existing statistical and diagnostic procedures in the classification of deaths, and that, unless such procedures are changed, this exaggeration will tend to increase rather than decrease or remain constant.

The results of this attempt to measure the effectiveness of the anti-tuberculosis activities so far in Cattaraugus may be summarized briefly as follows: the evidence afforded by the records of cases strongly points to the conclusion that the tuberculosis administration already has been effective within certain limits. The development of facilities for discovery, care and supervision of tuberculosis cases has resulted in: (1) an improvement in case-finding activities as shown by an increase in the number of active cases under supervision, by the number of minimal cases discovered, and by a greater emphasis upon the detection of childhood type of tuberculosis; (2) a reduction in the fatality of supervised active cases which has manifested itself in a marked decline in the mortality of children and adolescents. The gross result of this reduction in mortality is seen in a drop in the death rate from tuberculosis during the past five years which is statistically significant in itself.

The report points out, however, that the time has not yet come for a full appraisal of the *ultimate* results of this experiment in rural health work, and that this is true for several reasons. One is that childhood and minimal cases are just being brought under supervision and the effect of this type of

preventive work cannot be seen until several years have elapsed. Another is that the effect of public health education, especially in tuberculosis prevention and care, is not instantaneous but cumulative. The *immediate* results, so far as they can be reflected in mortality experience, of necessity are confined largely to the prolongation of the lives of cases that can respond to supervision and sanatorium care.

The report closes with reference to the fact that the tuberculosis death rate in Cattaraugus County has stayed on practically the same level since 1925, and asks the question: to what is this failure to maintain a further decline due? Is it due entirely to an accumulation of deaths of moribund cases? Were any of the deaths not under supervision of physicians, or of the Health Department, or of both? How much of the mortality occurred among persons who failed to cooperate with physicians or with the Health Department? To what extent were these fatal cases not reported promptly to the Health Department by the physicians and thus did not secure the benefit of the anti-tuberculosis facilities?

"No precise judgment can be made of the possible effect upon the death rate by an unusual accumulation of moribund cases," says the report. "There is every reason to believe that there has been a postponement of the deaths of a specific moiety of the cases due to the introduction of better methods of tuberculosis control. How large it is or exactly how long it will last, is neither statistically predictable nor certain from the point of view of a clinical prognosis. The facts that of the 127 deaths occurring in 1926-1929, 22, or 17 per cent, were of cases that had been under observation three or more years, and 29 more, or 23 per cent, had been under observation from one to three years may be suggestive. Further experience must be awaited before a clearer answer can be sought.

"More definite, although only partially complete, answers

to the other questions raised, can be made from a study of the rather careful socio-medical histories secured by Dr. Korns on all deaths that were officially ascribed to tuberculosis in the County in 1928-1929.[11] In these two years 64 deaths were so ascribed. Of this number 8 were definitely of persons who were not residents of Cattaraugus County or were of residents of Buffalo who took up residence in Cattaraugus County after treatment at Perrysburg; these 8 deaths may be subtracted from the 64 as not being true liabilities upon Cattaraugus County. In addition, there were 7 deaths for which the diagnosis of tuberculosis was considered doubtful by the Bureau of Tuberculosis; these also may be subtracted. We have left, therefore, 49 tuberculosis deaths of Cattaraugus residents for consideration.

"Now of these 49 deaths, 26 occurred among patients who had been under supervision of the Health Department with the cooperation of the physician for a period of not less than six months. The remaining 23 deaths occurred among persons who had not received any supervision from the Health Department. Of these, 9 may be ascribed to the failure on the part of the physician to cooperate with the Health Department and 12 were either entirely unknown to physicians or the Health Department or refused to cooperate.[12] The indication seems clear that if the same decrease in mortality as occurred among the cases under supervision is to be achieved

[11]Socio-medical histories of tuberculosis deaths were started in 1925 by Dr. William C. Jensen, then director of the Cattaraugus County Bureau of Tuberculosis. The data for 1928-1929 only have been used since records compiled by one person are more comparable in all details.

[12]In addition, there were 2 deaths for which there was record of inadequate service on the part of the Health Department. In one of these cases known to be a contact, no tuberculin test or X-ray was made and the patient was declared to be without manifest tuberculosis upon clinical examination. No "follow-up" of this case was made in spite of the fact that both the brother and the father of the case had recently died from the disease; a diagnosis was made only four months prior to death. The other case was that of the father of 2 boys who had died from tuberculosis and of a girl who had had the disease, no further inquiry having been made into this case until she was found in a dying condition.

among such cases as these, some further improvement in the case-finding machinery and in the cooperation of the private physicians is necessary.

"This fact has been fully realized by the County Health Department and its advisors, and already an experimental project for developing methods of more intensive search for cases, particularly among contacts and school children, has been begun in Cattaraugus County. This project is closely coordinated with an epidemiological study of tuberculosis that is now under way."