

REPRINTS AND REFLECTIONS

The medical aspects of the Framingham Community Health and Tuberculosis Demonstration[†]

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Introduction

A report of the progress of the Framingham Community Health and Tuberculosis Demonstration, particularly along medical lines, promises to be of value at this time, in view of the emphasis the war is placing upon the need for human conservation, and the heavy burdens the war will throw upon communities everywhere. The necessity for adequately meeting community health obligations is greater than ever before. In tuberculosis work, in particular, it is felt that perhaps the indications of the Framingham experience in its bearing on community health machinery and problems of disease prevention may also have a wider significance.

The Framingham Community Health and Tuberculosis Demonstration, initiated in December of 1916, has been in actual operation for a little more than a year. The foundations have been laid and the work is proceeding, stimulated rather than retarded by the World War.

Cooperation from government and private agencies has been generous and helpful. Advice and practical assistance have been received from many branches of the government of the United States and of the government of the State of Massachusetts. Many private agencies have contributed to the work, such as the American Museum of Safety, the Russell Sage Foundation, the Massachusetts Institute of Technology, etc. Locally, the community has been quick to meet its obligations and to seize opportunities for advancement along health lines. Numerous local agencies have participated in the work, including the town government, private civic associations, business organizations, insurance companies, private charities, churches, clubs, and individual citizens.

The Framingham Community Health and Tuberculosis Demonstration, conducted by the National Tuberculosis Association is under the supervision of a special committee on which are represented the National Association, the Massachusetts State Department of Health, the United States Public Health Service, private antituberculosis organizations in Massachusetts, Connecticut, New York, and Pennsylvania, Framingham health agencies, and the Metropolitan Life Insurance Company, the donor of the \$100 000 devoted to the work.

The activities thus far have demonstrated the necessity and efficacy of an educational, persuasive approach to the

community. The work throughout has been 'Framingham's opportunity' and not an experiment 'on' the town. Locally, it is Framingham's experiment, and it will be Framingham's experiment nationally, if it demonstrates that it is practicable for a community, within reasonable expenditure limits, to 'sanitize' itself.

The programme

Although, it is the object of this paper to present primarily the medical findings to date, it may be worthwhile to outline, as briefly as possible, the scope or programme of the work. The essentials of the Demonstration, as adopted by the committee, are as follows:

- (i) The sympathetic cooperation of individuals and organizations, public and private, in Framingham, and the carrying out of the work as Framingham's Plan, on an educational and democratic basis, at a minimum cost.
- (ii) The utilization of expert advisory service whenever feasible, and the encouragement of the community to meet its own health obligations, not only during the period of the Demonstration, but subsequently, in order that the non-experimental activities of permanent value to the community may be perpetuated subsequent to the close of the experimental period.
- (iii) The concentration on tuberculosis as the major interest of the Demonstration, and the designing and development of the programme as a war measure to meet the emergencies in the health field as emphasized in the present international crisis.

The development of an adequate community health programme presents theoretically certain clear and distinct aspects:

- (i) The preparation of the community for participation in and an understanding of the work.
- (ii) The diagnosis of community conditions, as to (a) the environment and (b) the individual.
- (iii) The application of the diagnostic findings to the community's special disease prevention problems. This step may be called 'community treatment.'

The main preparatory steps have included the issuing of special literature; the formation of local committees; the encouragement of the community to appropriate funds for its own health requirements; the development of a local medical organization;

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the determination of diagnostic, classification, and therapeutic standards for tuberculosis; the establishment of adequate laboratory facilities, etc.

The community diagnostic steps on the environmental side have included an analysis of the community's statistical background, a study of the general sanitary conditions in schools, factories and, in general, throughout the community. As regards the people themselves the important measures have included a survey of the hazards of infant life, a tuberculin survey among children, a sickness canvass, a medical examination campaign, the establishment of an expert medical consultation service, etc.

In addition to the foregoing investigative aspects of the community study there are the community treatment measures, now being undertaken. These involve the correction of environmental conditions, at home, at work, or in school; continuous education and publicity; the coordination of nursing and other local health activities; the control over milk and food supplies; and the development of out-patient medical service, together with special concentration on the hygiene and treatment problems of the tuberculosis cases as discovered in the medical examination or consultation work in school, factories, among infants, in physicians' offices, at the dispensary, or elsewhere.

The first year's work

During the first year the main objectives may be summarized as follows.

- (i) The thorough medical examination of a substantial proportion of the population, the discovery of cases of tuberculosis, and the lending of assistance to the community in the development of its programme of organization to meet its own health obligations.
- (ii) During this year the activities of the Community Health Station have included the voluntary expert examination of 5000 people of Framingham, about one-third of the population; an effort to discover and to place under treatment or observation incipient, advanced, or arrested cases of tuberculosis, numbering at present ~180; the provision of summer camp facilities for 100 delicate children; the tuberculin testing of ~500 children between the ages of 1 and 7 years; the referring of 4000 cases of illness or defect other than tuberculosis to local physicians for treatment; and the carrying out of the special surveys mentioned in the preceding paragraphs on 'the programme'.
- (iii) On the side of the community organization the main instruments, financed almost entirely by the community itself, have included a full-time tuberculosis nurse under the Board of Health; two all-the-year-round infant welfare clinics with full-time nursing service; full-time medical, nursing, and clinic service for the public schools; full-time medical, nursing, dispensary, and first aid equipment for the larger industries; the establishment of community houses for social and health work; the development of a medical club; domestic science classes; a group of neighbourhood lay committees for education, sickness reporting, and other activities.

All this machinery is organized for two purposes; first, to serve the general health needs of the community, and second, to discover, control, and prevent tuberculosis.

The chief medical aspects

Local medical organization

One of the first things undertaken in Framingham was the development, with the cooperation of local physicians, of a medical club, under the supervision of a local governing committee. Practically all of the practising physicians in Framingham are now members of this club, and under its auspices a series of lectures and clinics dealing with important medical phases of the tuberculosis problem have been conducted. With the aid of a committee of experts, a set of experimental diagnostic standards for tuberculosis among children and adults has been developed and is now in use in Framingham. The physicians have been encouraged to report all cases of tuberculosis, and to use the expert consultation service established by the Community Health Station, for the diagnosis of doubtful or difficult cases of disease. Special medical service has been provided for the infant clinics and for the schools and factories, this service being largely diagnostic in character, cases of illness being referred to physicians of the patient's own choosing for treatment.

It is hoped that the future may see the development of a plan for general morbidity reporting, the establishment of an out-patient, moderate-fee clinic service, the more extensive use of expert consultation service, and the use of medical machinery in general to elevate and standardize the methods of diagnosis and treatment for tuberculosis.

The sickness canvass

At an early stage in the work at Framingham, a lay canvass for existing illness was made. It was undertaken as a measure for obtaining a reliable percentage figure for admitted illness. It was also thought that such a canvass might serve as a useful basis for comparing sickness census findings with subsequent medical examination findings. The sickness census was also considered a necessary step, as a measure for comparing illness findings at the beginning with similar findings at the end of the demonstration.

The carrying out of this census was in many respects similar to sickness canvasses or health censuses undertaken elsewhere in the country, by the Metropolitan Life Insurance Company and other agencies. The agents of the several larger insurance companies in Framingham were used as canvassers, their work being supplemented by nurses. Representative sections of the community were chosen, and the month of April, 1917, selected as the time for this work.

The chief results of this study may be summarized as follows:

- (i) In the census group as a whole, comprising 1455 families or 6582 individuals, the sickness rate was 6.2%, based on 407 recorded cases of illness. The commonest affections, and the percentage they constituted of the total illness recorded, were as follows: colds, 13.5%; cardiac diseases, 8.6%; rheumatism, 6.6%; tuberculosis, 3.9%; pregnancy, 3.2%; diseases of the kidneys, 2.7%; 'nervousness', 2.7%; influenza, 2.7%; bronchitis 3.9%; etc.

The sickness rate (6.2%) is considerably higher than the rates usually recorded in previous sickness surveys, owing to the fact that many minor illnesses were recorded in this study. When the definition of illness is restricted so as to include only incapacitating affections, the sickness rate drops to 1.8%, a rate more comparable with findings elsewhere.

- (ii) The sickness survey disclosed 16 cases of probable tuberculosis, constituting 0.24% of the total number censused, and 3.9% of the total number of illnesses recorded.
- (iii) The rate of disability was 54.1%, a relatively low figure accounted for largely by the fact that many minor illnesses were recorded.
- (iv) The percentage of individuals recorded as sick who were receiving medical attention was 81.1%, a figure somewhat higher than findings elsewhere.
- (v) The sex distribution of individuals censused was a very equitable one, the figures being 3260 males and 3322 females. On the other hand, the sickness rate for females is relatively high (70.4, as compared with 53.1 for males). These figures, however, tend to coincide with the sex and age distribution in the community, a distribution characteristic of the older neighbourhoods.
- (vi) The tabulation for families in which sickness occurred, according to economic condition, showed sickness rates of 5.2 for the families recorded as being in good economic condition, 7.4 for families in fair, poor, and bad condition, and 5.2 for families whose economic condition was unknown.
- (vii) The percentages for illness discovered in the sickness census offer a basis for interesting comparison with actual findings on medical examination, and will be discussed under a subsequent heading.

Medical examination work

Up to the present time ~5000 people have been given thorough medical examinations by men expert in tuberculosis work, each examination accompanied by a microscopical and chemical urinalysis. For the most part this work has been carried out in 'examination drives'. The first drive, covering 1700 people, occurred in April, 1917, in conjunction with the sickness canvass, covering in large part the individuals censused at that time. The second drive took place in November, 1917, at which time ~2800 individuals were examined. In the meantime, a sufficient number have been examined to bring the total up to 5000 individuals.

At the present time the final tabulation of all the details of the second medical examination drive has not been completed, and for that reason the figures and percentages given below will be based on the results of the first examination campaign. Further, in this part of the discussion the remarks will be confined for the most part to the general medical findings, the details regarding tuberculosis discoveries being presented in a subsequent section of this article.

The medical examination campaign was undertaken as a measure for obtaining an accurate, cross-sectional picture of illness in a supposedly normal group of individuals in an industrial community; as a measure for obtaining an accurate

figure on actual illness for comparison with Health Census findings regarding admitted or recognized illness; and as a practical means for discovering, in a non-intensive way, a certain number of tuberculosis cases.

The procedure involved in the main the following steps:

- (i) The selection of families for the examinations. For the most part, the consent of families for examination was secured by nurses and insurance agents at the time of the preceding sickness canvass. Other families were secured through private physicians, through newspaper advertisements, special literature with cut-out slips for the return of name and address, etc.
- (ii) The selection of expert examiners for the work, being secured from the State Department of Health, the tuberculosis institutions in Massachusetts, Connecticut, and elsewhere.
- (iii) The laboratory arrangements. In the first examination drive all of the urinalyses were carried out in Framingham, a number of analysts being retained for this work. Subsequently the urine specimens were forwarded to *New York Daily*, where they were examined in the laboratories of the Metropolitan Life Insurance Company.
- (iv) The examinations themselves. For the most part, the examinations were carried out in the homes of the patients; two physicians and a nurse visiting as many homes as could be scheduled during the late afternoon and evening, this being the time when the majority of the family could be found at home. At this time a history was taken, an examination made, a urine specimen collected, and a preliminary statement left with the person examined regarding his condition, with recommendations as to the need for medical treatment.
- (v) Following the first examination campaign an examination day was set, at which time all who desired an examination were invited to come to the Community Health Station, the local physicians being urged to observe and participate in the work. The holding of examination days was subsequently abandoned, as being a relatively inferior method from the point of view of cost and accomplishment, as compared with the home visits.
- (vi) The follow-up work. Communications regarding non-tuberculous findings were sent to all individuals examined. Those individuals recorded as being suspiciously or positively tuberculous were followed up with nursing visits, sputum examination, temperatures, X-rays, etc., before a final diagnosis was determined upon. In each instance, the patient was urged to name a local physician, and an effort was made to secure a consultation with him in the presence of the patient.

The results of the first medical examination drive in Framingham were chiefly as follows:

- (i) There were in all 1682 examinations, 732 males and 950 females.
- (ii) For both sexes 44% of those examined were <14 years of age.
- (iii) A total of 1329 non-tuberculous affections and 48 cases of tuberculosis were discovered, giving a total of 1377 illness cases, or 82% of those examined. The most conspicuous

affections were as follows: defective teeth, 300; enlarged tonsils, 213; adenitis, 146; colds, coryza, 65; cardiac disease, 49; tuberculosis, 48; pharyngitis, 38; bronchitis, 30; kidney disease, 23; and arterial disease, 21.

- (iv) The ratio of illness to the total examined was the same for each sex.
- (v) The percentages of illness according to nationalities were as follows: Americans, 81; Italians, 79; Irish, 76; Poles, 81; Scandinavians, 83; Jews, 95; and others, 89.
- (vi) The findings according to families for the several income groups used in the study were as follows: less than \$700, 17%; \$700–1200, 18%; \$1200–1800, 15%; \$1800 and over, 16%; incomes unknown, 16%.
- (vii) A tally of total affections discovered in the 1682 people examined, including the 1329 major non-tuberculous affections, the 48 cases of tuberculosis, and 1211 chief complications, gives a total number of diseases recorded of 2588. A classification of these affections as to their preventability placed 57% in the entirely preventable class. The preventable and doubtfully preventable groups combined constituted 84% of the total, leaving an entirely non-preventable group of 16%.
- (viii) Comparison of medical examination with Health Census findings:
 - (a) In the Health Census, using a definition of illness that included minor affections, the percentage sick of the total canvassed was 6.2; in the medical examination work, using an equally liberal definition of illness found, the percentage sick of the total number examined was 82, or 13.2 times the amount of sickness found in the sickness canvass.
 - (b) In the Health Census or sickness canvass, 0.24% of the total people canvassed were recorded as tuberculous; in the medical examination work 2.85% were found to be tuberculous, or 11.9 times the Health Census findings.
 - (c) In the Health Census, tuberculosis constituted 3.9% of all the illness cases recorded; in the medical examination work, tuberculosis constituted 3.5 of the illnesses found, or 0.4% less than in the Health Census.

The von Pirquet survey

A von Pirquet tuberculin survey of children between the ages of 1 and 7 years was carried out during the summer of 1917, the work being done by a single expert. The reasons for undertaking this work were:

- (i) To determine at the beginning of the demonstration the percentage of positive reactions in a definite age group, as an index of infection for comparison with possible subsequent findings.
- (ii) To determine the comparative reaction percentages for different nationalities, neighbourhoods, etc., and the reliability of the tuberculin test in the younger age groups as an index of genuine tuberculous disease.
- (iii) To throw light, if possible, on sources of childhood infection, and to select those children most needing special hygienic care.

The subjects for this test were selected on a family basis, consent being gained by nurses visiting selected portions of the

community. For the work, the tuberculin (O.T.) was secured from the Saranac Research Laboratories. The tests were made in the home, followed by 24 and 48 h inspections. In order to check up the findings a certain number of re-examinations were made. All the children were given a medical examination, and special follow-up examinations were performed upon the children with positive reactions.

The results showed for males 32% positive, and for females 35%, the children being practically uniformly distributed throughout the ages covered, and totalling 460 in all. A decided increase in the percentage of positive reactions was noted for both males and females at the beginning of the school age, as indicated by the percentages for the years 6 and 7, when 38% of the males were found to be positive and 55% of the females.

Of special interest were the findings according to nationalities. These ranged as follows: Italian, 51%; Irish, 30%; Jewish, 30%; American, 18%; others, 27%. Upon re-examination of the positive reactors, no clinically active cases were discovered. These children will be given re-examinations subsequently, to ascertain if any of them show a later development of active signs and symptoms.

It is interesting to note that while Italian stock gives the highest percentage of positive reactions, very few active cases of tuberculosis have been found among the Italians either in adults or children. On the other hand, while the percentage of positive reactions among Irish children is low, the Irish stock in Framingham and elsewhere contributes more than its share to active tuberculosis, particularly among adults. Careful studies are being made of environmental conditions, milk supply, etc., and it is hoped that eventually this study, with its sequel, will throw some light on the problems of exposure and resistance.

Nursing coordination

The coordination of the various nursing activities in the community is considered of prime importance to the success of the demonstration. This should include the work at the local hospital training school, the district nursing activities, the relief and infant welfare nursing, the school nursing, the industrial nursing, the tuberculosis nursing, the community centre nurses working from the community houses, etc. As a part of this work, it is also proposed that a course of instruction for nursing assistants be carried out by the hospital, in coordination with the Nurses' Training School, and the Domestic Science Department of the State Normal School.

Tuberculosis findings

The staff for tuberculosis work includes the physicians and nurses engaged by the Health Station for the discovery and diagnosis of cases, and a nurse employed by the Board of Health for the follow-up and treatment of cases after their status has been determined. Cases come to the attention of the health office from various sources, indicated in the following list showing the number derived through the several avenues of discovery: on record at the beginning of the work, 27 cases; examination drives, 86; the draft, 7; special consultations, 26; reported by physicians, 32; and factory examinations, 2. This gives a total of 180 cases of all kinds, which have come under the direction of the Health Station workers, since the beginning of activities in Framingham.

Of these 180 cases, 18 have died, 16 have left town or have been lost, 15 are receiving treatment in out-of-town-institutions, and 131 are under care in Framingham. Of 146 living cases, 55 are incipient, 23 are advanced, and 68 are arrested; 136 are pulmonary and 10 non-pulmonary. Since the beginning of the Demonstration, under the care of the Health Station, including lost and dead cases, there have been 112 active cases, either incipient or advanced.

The death rate from tuberculosis for the period 1906–16, with corrections resulting from a special study of the reliability of mortality certification, has averaged 120 per 100 000. Ordinarily in the past ~35 cases have been known at any one time, which constitutes 0.22% of the population, and averages 2.3 cases per death. With an average number of deaths of 15 annually, it has been estimated that on a basis of six cases to a death, there should be in Framingham ~90 active cases.

It is interesting to note that among the 4500 individuals examined in the special drives in Framingham, there were 91 cases discovered, giving a morbidity rate of 2%. This rate applied to the town would give 320 cases, active and arrested. This basis would indicate that there were in the community 19 cases for every death, including arrested cases, and ~10 cases for every death, when active cases alone are considered. About 49% of the 91 cases discovered in this group were arrested, which would mean that there should be in Framingham ~163 active cases. As stated above, during the last year, 112 cases have come under the observation of the workers.

It is necessary, of course, to await future developments before a decision can be reached as to the reliability of the above rates. It is not the purpose of this paper to attempt to draw conclusions at this time. The findings are presented to indicate the scope of the Framingham work and its tendencies. It may be stated that at the present time a series of monographs is being prepared, dealing separately with each of the studies mentioned above as well as other activities not touched upon here. In this monograph series the results will be presented more fully and tentative conclusions suggested as far as is scientifically reasonable.

General mortality findings for 1917

Finally, it may be worthwhile here to indicate briefly in a summary fashion the mortality rate tendencies in Framingham as indicated by the 1917 findings. Obviously, no conclusions can be based on these findings:

- (a) The general death rate, corrected for non-residents, has averaged 13.65 per 1000 for the last 10 years in Framingham (1906–16). In 1917 the general death rate was 11.1.
- (b) The infant mortality rate in Framingham for the previous 10 year period was 81 per 1000 born. In 1917 it was 73.
- (c) The tuberculosis death rate, corrected for non-residents and for errors in death certifications, averaged for 1906–16, ~121.5 per 100 000. In 1917 the rate was 99.6.

Conclusions

The Framingham Community Health and Tuberculosis Demonstration aims to be not only an investigation and an experiment in community disease control; it should also be a demonstration of a community method, successful or not, as events prove, of disease prevention and health administration. The latter aspect especially will be of wide interest.

An accurate presentation of the findings of this social laboratory, as forecast in the above mentioned monograph series, is therefore of value. It may be that 'the results of the Framingham experiment will be more important than the result'. In any event, knowledge of the progress of the work may stimulate similar studies elsewhere.

Thus far the Health Experiment has apparently demonstrated the importance of sympathetic cooperation from local and outside agencies, as a basis for community social control over disease producing factors. It is the hope and anticipation of the committee that further developments will demonstrate that on a community basis, disease may be prevented and health created, thereby laying a permanent physical foundation for future social, economic, and spiritual evolution.

Commentary: Medical aspects of the Framingham Community Health and Tuberculosis Demonstration

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The Framingham Community Health and Tuberculosis Demonstration Study¹ not only showed that community control of disease-producing factors is feasible and effective for combating tuberculosis but also that this approach was likely to be the