Commentary: Donald Budd Armstrong (1886–1968)—pioneering tuberculosis prevention in general practice

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Early in the medical career of Donald Budd Armstrong (1886–1968), a leaning toward public health was evident. In 1912, he graduated MD from the College of Physicians and Surgeons, Columbia University (known colloquially as P&S). It is a fair assumption that his interest in public health was stimulated by Haven Emerson, grandnephew of Ralph Waldo Emerson and a lecturer in physiology and clinical medicine at the College. Emerson had switched to lecturing in public health in 1913, and became a major figure in academe as a protagonist of public health.1 Armstrong, as a student during the Emerson years, followed suit in focusing his interests on public health. In 1910, academic studies in the field had been introduced at the University of Michigan. In 1913 William Sedgwick, at the Massachusetts Institute of Technology (MIT), had joined with the Harvard faculty Milton Rosenau (Professor of Preventive Medicine) and George Whipple (statistician and sanitary engineer) to establish the first school of public health in the United States.2 In that year, Armstrong was awarded the degree of Master of Science in Public Health from MIT.

Degrees in hand, Armstrong set up practice in New York City and also busied himself—a term we use advisedly—with various activities of the City Public health Department. In the next several years he chaired the Association for the Health of the Poor, the Departments of Street Cleaning and Sanitation, the Department of Social Welfare, and the Committee on Food Supply, all the while lecturing to medical students at New York University, to aspiring teachers at Columbia’s Teachers College, and to the students of City College. By 1916, he was involved nationally. He had assumed the chairmanship of the Sociological Section of the American Public Health Association, served as the Assistant Secretary of the National Tuberculosis Association, and then as its Executive Officer. Given such broad and intense activity in public health matters it is no surprise, in that same busy year, to find him accepting the position of Executive Director of the Framingham Community Health and Tuberculosis Demonstration (FCHTD) in Massachusetts. This demonstration project is the central topic of this annotation.

A brief review of the level of understanding of tuberculosis in the United States up to and through World War I might be useful in evaluating the Framingham undertaking.3 The idea of sanatoria for affected patients that would provide isolation, good food, and rest was realized in 1875 in Asheville, North Carolina. In 1882, Robert Koch’s momentous discovery of the tubercle bacillus had added the cogent rationale for isolating affected patients to prevent transmission, and in 1884 another sanatorium opened at Saranac among the lakes of Northern New York. By 1907, Von Pirquet had developed a diagnostic test for tubercular infection, later supplanted by Mantoux’s intradermal test.

The partial or total collapse of an affected lung by artificial pneumothorax was perhaps the first active intervention pursued for treating tuberculosis. It remained in vogue through World War II and for a while thereafter. We are not aware of any trial that showed artificial pneumothorax to be an effective treatment, but one must allow that it was only in the 1930s that R.A. Fisher’s brilliant devices of random assignment of subjects together with blinded observers and analysts had provided the critical tools for sound trials of effectiveness.4 The first major step forward in the modern era of treatment of tuberculosis, the encore to Fleming’s penicillin, was the development of streptomycin by Silman Waksman in 1952. The effect of the new antibiotic, critical as it was, was somewhat undercut when the mycobacterium was found rapidly to develop resistance and the serious side-effect of deafness. Quite soon, however, streptomycin combined with other medications (PAS and then isoniazid) provided an effective treatment that could be long sustained.

To return to our subject, Armstrong at Framingham in 1917,5,6 we first set out the objectives and achievements of the FCHTD below. We then weigh in what respects that program was unique and pioneering, and thus a harbinger of new ideas and practices in the community control of tuberculosis. The Metropolitan Life Insurance Company was the sponsor of the first Framingham project. This large American corporate organization was remarkable for an enlightened approach to health matters. It gave every indication of being guided by the idea—to the benefit of the insured as well as the insurers—that to maintain the good health of populations at risk could be only an advantage. Indeed its regular publications over many decades of the 20th century of data on sickness and mortality made manifest the interest of the company in the demographic and health data.

The venture into the ‘Community Health Demonstration Project’ at Framingham seems to have been the joint initiative of Dr Lee Frankel, the senior medical member of the Metropolitan staff and the probable progenitor of the idea, and of Louis Dublin, a distinguished medical statistician and demographer and the Third Vice-President of the Company.

Although the focus on the ‘typical’ urban milieu of Framingham was narrow, the design aimed to do more than...
measure the amount and the characteristics of tuberculosis in the community. The basic plan was also to test what useful and affordable steps might be taken to alleviate ill-health. It surely reflected a genuine interest in the prospects for limiting adverse social influences on health. From the beginning, the National Tuberculosis Association was supportive of the demonstration. At that time the scourge of tuberculosis, a chronic debilitating illness with a high mortality rate—the ‘Great White Plague’—beset especially the younger and the most productive adult age groups. In addition to the specific and interested support of a major insurance company for a study that might yield clues to prevention, general community support seems to have been expected but was by no means certain. In the United States and elsewhere, in those times and for many more decades, stigma and fear of tuberculosis were widespread among the public. The risks of transmission generated dangers and heavy personal and familial burdens. These were intrusive factors always to be weighed in dealing with the response of communities to tuberculosis.7

Dr Armstrong, described as keen, well qualified, and energetic, was the lead figure in implementation.8 Besides the paper that stimulated this review,6 he wrote a series of reports on the study.8 The ‘philosophy’, he stated several times, ‘is that of a Demonstration’ and also of an ‘Experiment’. It is for the community and by the community in the cause of community ‘social control’. The patent and immediate objective, while not explicitly stated, was to establish a pattern of actions and a set of services that could be sustained to reduce preventable causes of ill-health, and more especially tuberculosis and child mortality. First steps were to inform the community of the demonstration being planned, and to enlist their interest and co-operation. All the practitioners of the town were encouraged to join a medical ‘Club’. At the regular meetings of the Club, experts would lecture on various health matters and about tuberculosis in particular. Professionals who could usefully be consulted about the disease were made known and introduced.

The main target of the inquiry was active tuberculosis. The stated objective was to build a community program that would add to the resources and the reach of the official health leadership. At the outset explicit questions were posed: (i) How much tuberculosis existed in the population? (ii) How best to treat tuberculosis? (iii) How effective were the modes of treatment then in regular use?

These initial questions were a prelude to two objectives: (i) to expand programmes both for general health and for treating tuberculosis and (ii) to ascertain the monetary costs of deploying a full-scale programme to realize the specified objectives. To these ends, 13 000 of the 17 000 residents were examined by physicians, 7000–8000 of them by the ‘Demonstration’ (by then ancillary diagnostic aids, aside from the tuberculin tests for diagnostic immune reactions, included chest X-rays and sputum smears). The project set up three parallel procedures to identify illness in adults and children. The first procedure was assigned to nurses. A ‘census’ derived from home visits yielded data on current illnesses and usage of services, the hospital, and clinics. The second procedure was assigned to doctors. They carried out 5000 physical examinations, most of them in the homes of their patients. The third procedure related to children. The von Pirquet test to detect an immune response to tubercular infection was administered to all children attending a number of schools. From all these procedures the findings for a range of illnesses, whether mild or severe, were analysed and compared. Separate rates for all illnesses and for tuberculosis were set out by age, sex, and country of origin, although published only in brief summary.

The Demonstration proceeded with an ambitious programme. It provided the needed equipment and additional personnel to execute the plan to examine infants, preschool and school children, and adult workers. The latter were subjected to compulsory examinations by the industry. A continuous health campaign was launched with periodic health examinations provided for all those who chose to make use of them. Expert consultation was available to help gather and analyse data—strong odds are on Louis Dublin for statistical analysis.

The survey was carried out capably and expeditiously. Armstrong described the findings of the Demonstration in a series of brief monographs. At the end of year 5 of the Demonstration the mortality rate among tuberculosis cases had declined by two-thirds from the baseline. The substantially improved survival is apparent in the ratio of active cases to deaths—3:1 in the first year, the ratio had risen to 9:1. As Armstrong himself interpreted the results, the improvement was owed to an assembly of elements in two main factors. One factor was case-finding; a matter of detection of active cases in the community, by means of periodic health examinations conducted by responsive practitioners among a compliant citizenry. In 3 years, the reported average annual prevalence rose from 13 to 39 cases, and detection of early cases almost doubled from 45 to 83%. The second factor was an admission rate of active cases to hospitals or sanatoria that almost trebled—from 15% in year 1 to 42% in year 3—a result Armstrong attributed to the ready access to expert consultation. By 1921, mortality in Framingham had declined by 67% from the rates recorded from 1908 to 1917, compared with a decline of 18% over the same period for the whole of Massachusetts. Even in the light of the modern view of evidence originating with Ronald Fisher, and in epidemiology with Major Greenwood, Bradford Hill and Richard Doll, Armstrong’s interpretation of the results was reasonable. With the new programme, Framingham’s estimated cost for municipal health programmes rose ~6-fold, from 40cents to $2.30 per person per year, which was considered affordable.9

The widely distributed Bulletin of the Metropolitan Life Insurance alerted other cities and communities to the successes at Framingham. In 1968, the editorial obituary for Dr Armstrong in the American Journal of Public Health5 described the FCHD results as having effected a turning point in community action on tuberculosis. Such other improvements as declining perinatal mortality rates were also documented. Armstrong himself, however, maintained caution in interpreting both these findings and those on tuberculosis. The rates for both tuberculosis and perinatal mortality, he pointed out, were also falling in Boston and elsewhere, although to a distinctly lesser degree.8,9

One missing aspect in the reports of the Framingham demonstration is the role of isolation, which gets no explicit mention. Perhaps it was taken for granted: it was in fact part of the action, whether intended or not, as reflected by the raised frequency of hospital and sanatorium admission. In contrast J. Arthur Myers, the great authority on tuberculosis in Minnesota
starting out in 1920 and into the 1950s,3 always gave central attention to the person to person movement of the bacilli within sanatoria and within the home. This aspect may well have been part of the ‘hygiene’ mentioned in the Demonstration programme, but it is nowhere spelled out.

Where and from whom the idea of conducting a community health survey originated is left obscure. One can cite at least two sources for precedents, on the one hand for surveys, and on the other for an initiative of a single-handed medical practitioner. Here we pause to note some early exemplars. In none of these, however, could one say ‘by the community’ as with Armstrong, but only ‘of the community’ or ‘for the community’.

For surveys, one might point first to post-revolutionary France early in the 19th century, and then to Britain some two decades later. In France Luis René Villerme and his contemporary Parent-du Chatelet carried out health surveys, each with his own particular objectives. For some institutions—such as the military, the prisons, workhouses, and hospitals—Villerme’s intent was clearly to establish that improvements in the health of residents could follow improvements in conditions. The subjects of Parent-du Chatelet’s survey were the brothels of Paris that had flourished by providing the services of poor girls and destitute women to their male clients, and his intention matched those of Villerme’s.

In Britain Edwin Chadwick was inspired by the French example to conduct his own national surveys of the conditions of the people of Britain. From 1839 to 1879 William Farr, Chief Statistical Officer to the Registrar-General and once a student of the great Jean Pierre Louis, sustained his annual reporting on the national health statistics of Britain as well as conducting some field surveys on specific issues. John Simon, from the time of his appointment as Medical Officer to the City of London in 1840 until his retirement as the Chief Medical Officer of Britain, published regular annual reports on the health statistics of the fields covered by his posts. Around the turn of the century, both Charles Booth and Arthur Rowntree surveyed the conditions of the poor and publicized their plight. An antecedent rather closer to Armstrong’s work can be found in the general practice of the gifted William Budd in Bristol, England. In his practice in and around that city, Budd kept records of the specifics of morbidity and mortality over time. He was persuaded to report his findings on typhoid as an infectious disease only some 20 years after his investigations, in 1856 in two papers in Lancet and in 1860 in the British Medical Journal, although his observations dated from more than two decades before.10,11

In the United States, Edward Jarvis in 1855 published his Report of Insanity and Idiocy in Massachusetts.12 Similar to most of the above examples, this was a survey based on a particular population at one point in time, and was not planned to be longitudinal. The Framingham study nonetheless continued for 7 years, although it is not clearly stated at the onset that this continuity was planned or even expected.

Subsequent to Armstrong’s Framingham study published in 1918, we can find analogies and advances 20 years later in the social medicine, initiative of Sidney and Emily Kark at Pholela in rural South Africa. To our knowledge, however, their many-sided approach was an independent initiative with no recorded precedent. No reference to Armstrong and Framingham is to be found in the quite full accounts that Sidney Kark provided of his experiences and ideas.13 More surprising is the absence of any echoes of Armstrong’s work in the later reports on community ‘control’ of tuberculosis in the US, the UK, and elsewhere. In South Africa, in our own work of the early 1950s on creating a community-based tuberculosis service in the Black ‘township’ of Alexandra, we were entirely ignorant of Armstrong’s study. However, we followed eagerly the local model of Sidney Kark as well as the many works on tuberculosis of Arthur J. Myers in Minneapolis. Myers was a major American authority on tuberculosis of the late 1920s through the 1950s. In the reports and books we have examined, surprisingly we find no mention of Armstrong or the Framingham studies. Yet Myers applies the same principles as Armstrong in his emphasis on case identification and isolation in general, and on case-finding in children by periodic tuberculin testing (von Pirquet or Mantoux). Myers qualified in 1920, by which time Armstrong had published several monographs on the Framingham experience as well as his 1918 paper. Within 5 years of his graduation, Myers’ prolific writings had begun to appear in print.3

Both Armstrong and Myers spent much of their careers in organizations concerned with a public health perspective on tuberculosis. Their ignorance—we do not think their mere indifference—to each other’s major contributions to the same disease, is a mystery we have failed to solve. It is perhaps of no great account, but out of mere curiosity we would hope that an answer might yet be found.

References