examination by plate culture are so excessively minute that it cannot be inferred from such want of detection in the sample that the bacteria are really absent from the bulk. This objection is, however, met—at any rate, to a considerable extent—by the experiments carried out by Professor Ray Lankester. In some of these a considerable volume of raw river water was passed through a Pasteur-Chamberland filter, which, while it allows the water to percolate, holds back all the bacteria, while in others the substance for examination was obtained by taking some of the gelatinous layer of living microbes that had accumulated on the surface of a filter of one of the London water companies. The material obtained by these several processes from a relatively large bulk of water was then subjected to the most delicate of modern tests for the detection of typhoid bacilli—namely, that known as the method of Parrieti, and in no case was this bacillus found to be present. Experiments such as these, though they cannot be said to demonstrate the total absence of pathogenic bacteria from the river water before it enters the filter-beds, yet add largely to the probability of their being present, if at all, only in very small numbers.

(To be continued.)

MANCHESTER LIFE TABLES.

By JOHN TATHAM, M.A., M.D.
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It is abundantly clear that the vitality of the population of Manchester taken as a whole compares very unfavourably with that of England and Wales taken as a whole; and we are naturally led to ask whether the whole of the population of the city is subject to the same adverse conditions, or whether it is composed of sections differing widely in respect to their average lifetime. The excessive death-rates in the township of Manchester suggest a comparison between this portion of the city and the outlying townships; and accordingly two subsidiary life tables have been constructed. In order that these two life tables may fairly represent the populations of the areas chosen, special care has been taken in the distribution of the inmates and deaths in public institutions to the townships to which they belonged.

The figures in table P are of startling significance; for they show that, while up to middle age the survivors in the outlying townships fall but slightly (4 to 6 per cent. for males, and 2 to 4 per cent. for females) below the standard numbers of Dr. Ogle's English Life Tables 1871-80, in the township of Manchester the deficiencies are enormously greater. Thus, for every 100 males who should survive at ages 5, 15, and 25 respectively, Manchester township shows numbers decreasing

from 85 to 81, the corresponding proportions of female survivors being from 87 to 83 per cent. of the standard; at age 45 the male survivors have dropped to 64 per cent., and the females to 71 per cent. of the standard; and at age 65, only 34 males and 42 females survive out of every 100 of each sex who should be living. As a rough measure of the loss of working power which results from this heavy mortality, it may be noted that the survivors of each sex at age 25 in Manchester townships scarcely exceed the numbers who should reach 45 years of age. In other words, the numbers who reach the threshold of this, the most active, and in many respects the most important, vicennium of lifetime, are equal only to the numbers who should survive to the end of that period. That this heavy mortality in the earlier periods of life indicates enfeebled vitality in the survivors there can be no reasonable doubt, and if there were it would be removed by the figures in table Q, which shows the mortality to be even more excessive in the life-period 25-45 than in those which precede it.

A noticeable feature of this table is the comparatively favourable figures for both the divisions of Manchester in the two life-periods of 5-15 and 15-25, and especially in the latter. This, no doubt, is partly due to the immigration of healthy lives at these ages from country districts. The improvement is, however, in great part only apparent, as will be seen if we consider the deaths in each period instead of the survivors.

The mortality in Manchester township is clearly greatly in excess both at 5-15, and at 15-25, in spite of the evident effect of the introduction of healthier lives. As a possible explanation of the figures for Manchester township in Table Q, it may be suggested that the population consists, roughly speaking, of two distinct factors: (1) persons of feeble or unsound health, born in the township, of parents whose vitality was already impaired by their occupations and surroundings; and (2) persons of originally sounder health who have migrated from country districts into this part of the city. The former of these two classes is subject to very high rates of mortality throughout, rates so high that at such ages as 40 or 50 they are probably comparable with the rates at 70 years of age in England as a whole. The heavy mortality shown by the tables at ages 25-45 and 45-65 is a combination of these enormous rates with the rates to which the healthier section of the population are liable. But the vitality of these latter is, in turn, becoming impaired by overcrowding and unhealthy occupations, so that even at ages when the natives of the township have practically disappeared from the life table the excess in the death-rate is still maintained. This suggested explanation is put forward with some diffidence, as a hypothesis for the testing of which it is hoped a basis of facts may at some future time be available.

* Extracted from the Manchester Life Tables, new and extended edition, by Dr. Tatham.

In table L the expectation of life at birth in Manchester as a whole was shown to be 34·71 years for males and 38·44 years for females, against 41·35 for males and 44·62 for females in the latest English Life Table. We see now that this general expectation of 34·71 years for males is compounded of an expectation of 38·11 years in the outlying townships with one of only 28·78 years in Manchester township; and that the general expectation of 38·44 years for females is compounded of an expectation of 41·58 years in the outlying townships with one of only 32·67 in Manchester township. Thus, it appears that the difference in mean lifetime between those living in the inner and outer parts of the city is about nine years—the former showing a deficiency of about 12 years and the latter of about three years from the standard. This, however, hardly expresses the real state of the case; for, as already pointed out, each of these areas contains two sections of population, differing in their origin, and not improbably differing widely in the rates of mortality to which they are subject. And, in the same way as the expectation of life in the whole city is seen to be made up of two separate expectations in different parts of the city, differing by no less than nine years, the low expectation of life in Manchester township may be regarded as made up of a still lower expectation for those born in the city, or entering it at an early age, combined with a somewhat higher one for those who migrate into it after reaching adolescence.

The numbers reaching 65 in Manchester are very much smaller proportions of the births than the numbers reaching the same ages in England and Wales. Thus, of 100,000 males born in England and Wales, 29,716 reach 65 years, and 14,496 reach 75 years of age, and these have 313,635 years and 91,949 years of future lifetime respectively, or an average of 10·55 years for those who reach 65 and an average of 6·34 years for those who reach 75; while in Manchester township of 100,000 males born only 5,111 reach 65, and only 1,468 reach 75 years of age, the aggregate future lifetimes being 38,240 years and 6,694 years respectively, or an average of 7·48 for those who reach 65, and an average of 4·74 for those who reach 75. Still, the fact remains that, according to the life table, the few in Manchester township who reach old age compare favourably in their chances of very long life with the larger proportion of the general population who reach old age.

The explanation is probably two-fold, and in both connections it may reasonably be traced to the very large proportion of the population belonging to Manchester township who are in receipt of poor-law relief. *In the first place, there is the well-

known tendency of old people to overstate their ages, the effect of which is to give us a rate of mortality for, say, age 70, which is really the rate belonging to some lesser age, say 65; and there are grounds for believing that this tendency is greater among those applying for poor-law relief than among those who are able to support themselves. In the second place, there can be little doubt that the lives of inmates of the workhouse at Crumpsall are to some extent prolonged by the care they receive in that institution.

Table V shows that the male children born in Manchester township lose, on the average, 15 per cent. of the period of childhood (under 15 years of age), 31 per cent. of the working period of life (15 to 65 years of age), and 76 per cent. of the period of decline; while those born in the outlying townships lose 4 per cent. of the period of childhood, 6 per cent. of the working period of life, and 37 per cent. of the period of decline.

Table W presents, in a small space, the main features of the three life tables we have been comparing. It shows that, for each sex, of the total average lifetime (or expectation of life at birth) in England and Wales, 65 per cent., and in the outlying townships 63 per cent., belong to what we have defined as the working period of life; while of the much shorter lifetime in Manchester township, only 58 per cent. in the case of males and 59 per cent. in the case of females can be regarded as coming within the working period. Looking at the figures in another way, we may say that on an average each male child born in Manchester township loses 10·48 years, or 39 per cent., and each female child 9·82 years, or 34 per cent. of the normal working period of life; the losses in the outlying townships being 3·00 years, or 11 per cent. of the normal working period for males, and 2·66 years, or 9 per cent., for females.

A comparison with the Manchester life table constructed by the late Dr. Farr, and based on the population in 1841 and the deaths in the seven years of 1838-44, shows that although the total mean lifetime has improved to the extent of about four and a-half years, the mean future lifetime of those who survive the dangers of early childhood has actually decreased by fully three years.

That a formidable waste of human life is constantly going on amongst us is familiar knowledge to those who have even superficially studied the mortality statistics of Manchester. The amount of this waste and its incidence at the various age periods is plainly indicated in the three life tables which are here accessible for the first time. Up to the present point our investigations have proved the existence of a strong contrast between the health conditions obtaining in the central parts of the city and those in the outlying townships; and they have exhibited that contrast in perhaps its most telling form. Nevertheless, we have as yet by no means exhausted the rich store of material con-

* At the census of 1891 the inmates of the workhouse establishments in England and Wales were 1 in 159 of the population; in Manchester township the proportion was 1 in 52.

tained in these life tables. We may, however, claim to have established the fact that whilst the population of certain districts of our city compares not unfavourably with the rest of England and Wales, there are, nevertheless, other districts—as, for instance, those comprising the old township of Manchester—in which an appalling sacrifice of human life is still constantly taking place. Here is a population of nearly 150,000 persons paying a tax which must be reckoned, not in pounds, shillings, and pence, but in years, months, and days—a tax amounting on the average to fully thirty per cent. of the lifetime of every member of the community. Here are men and women entering the period of decline at an age when they ought scarcely to have passed the prime of life. And what is particularly distressing in this regard is the thought that although in some respects the local conditions of life have improved within the last half century, in other respects bad has become even worse.

But are we to rest satisfied with having exposed this alarming sacrifice of human life and assessed its amount? Is it not, rather, our plain duty to inquire whether it is not in some degree avoidable? How much of the terrible death-toll is due to the nature of the people's employment; how much to the state of their dwellings; how much to their home life—the personal habits of the occupants of our slums? These are some of the problems which confront us at the very threshold of our inquiry. Their solution will certainly tax our best energies—perhaps, indeed, it may at present be impossible—but we dare not shirk the attempt. The task which lies before us and our successors is nothing less than that of restoring to every infant in the Manchester township the twelve years of life expectation of which it has been defrauded by the evil surroundings of its birth. How far we have succeeded in this task, and how far we have failed, can only be known when the death records of the ten years 1891-1900 come to be compared with those herewith presented, which relate to the recently completed decennium 1881-1890.

REPORTS OF MEDICAL OFFICERS OF HEALTH.

SHEFFIELD.

Small-pox.—The difficulties of dealing with persons who have been exposed to the infection of small-pox, but who refuse to be revaccinated, are well exemplified in the following extract from Dr. H. Littlejohn's report:—

“A man, aged 23 years, contracted the disease probably at Stocksbridge. No doctor was called in, and he stayed at home with the rash out on him (from May 3rd) for a week before the case was reported and his removal effected. Two sisters worked in a cigar factory, where about 40 other

girls were employed. They continued to go to work while their brother was ill at home, and although they did not develop the disease themselves they must have carried the infection on their clothes, for on the 12th, 15th, and 16th of May cases occurred among the other girls of the factory. When the brother was taken to the hospital, they and the other members of the family were also removed for isolation, so that the infection must have been carried by them during the week their brother was ill at home and they were going to work. Two other girls subsequently developed the disease, but they probably caught the infection from one of the three later cases, and the dates of their illness point to this.

“The question of how to deal with the work-people in the factory was a difficult one. Forty girls living in different parts of Sheffield had been exposed to infection. They refused to be revaccinated, and therefore all we could do was to visit the premises daily, ask if anyone complained of feeling ill, and pay a visit to the houses of any absentees. The manufacturer also promised to let us know at once of any person who complained of being unwell. By this means we minimized any risk, and, as it happened, were enabled to remove five persons in the very first stages of the disease, and before they had become highly infectious.”

SOUTH SHIELDS.

Is the Infection of Small-pox Transmitted Aerially?—Dr. Turnbull, in his annual report, gives a suggestive account of the treatment of small-pox in the vicinity of scarlet fever wards:—

“At the time when the first case of small-pox was reported, towards the end of October, it was a moot question with me whether we did not incur greater risk in removing the patient to the Denes Hospital than in leaving him to be treated at home. The only ward available was within a comparatively short distance of the scarlet fever ward, where there were then some 20 patients, at ages ranging from two to 16 years, under treatment, and within a still shorter distance of the Denes Lane, a much-frequented road. The conditions under which the patient was housed, lodged with a relative in a flat of two tenements with a common stair, decided the question. He was removed, to be followed two days later by a shipmate, and up to the end of the year eight cases were treated in the same ward block.

“The most stringent precautions were taken to prevent the introduction of the disease amongst the other patients. The whole of the staff were revaccinated, and communication between the ward and the administrative block absolutely forbidden. The food for the patients and nurses was taken to the door of the ward and left there to be afterwards taken in by the nurse, and every article leaving the ward was placed and allowed to