not exceed forty-eight hours. Under these circumstances, and after the other possible causes had been excluded, the sudden outcrop of many cases in a localised area pointed to a milk-epidemic.

It may be of further interest to briefly state the main reasons that made me hesitate before I pronounced the milk to be the cause of the infection:—

1. The outset of the outbreak was not characteristic of milk-borne infection. Instead of there being five infected houses on November 9th, and eight more on November 10th, one would have expected many more, seeing that the supply was a large one.

2. The theory of milk-infection did not explain away the very marked and special fall of the outbreak upon Hendon Lane, since we should expect to find the infection carried all along the track of supply of the particular cart and cans that conveyed the milk to Hendon Lane. What really happened was that at the commencement of the outbreak, of twenty-two houses supplied in that street, five were infected, whereas of fifty-six houses supplied in other streets only six were infected.

3. Children were not mainly affected. Among the cases of which I was informed there were nearly twice as many people over twenty as there were children under ten. [I was struck with the large proportion that the domestic servants formed to the total number of sufferers. The fact may be accounted for by the frequent practice among servants to take a sip of the milk when they receive it at the door.]

4. It is general knowledge that cows may suffer from certain eruptions on teats and udders without conveying any infection to the milk, whereas it is equally established that milk in similar cases can give rise to scarlet fever and diphtheritic throat trouble among those who consume it.

5. I had been able to satisfy myself that in Hampstead and Stoke Newington there were, at the time, many *somewhat similar* throat cases.

The conclusions which I came to were:—That the outbreak was probably favoured by the excessive rainfall and variable temperature of the preceding fortnight, upon a cold, damp soil, at a season of the year when throat trouble is generally markedly in evidence. Under these favourable conditions a mild infection probably conveyed in milk was sufficient to give rise to an outbreak of throat-illness of a diphtheritic character. I decided to recommend, by means of small posters, the residents in the District to boil all milk during the ensuing fortnight, and in the meantime steps were taken to ensure that the affected cows were adequately dealt with. I could not possibly have had a more satisfactory vindication of the correctness of my conclusions than the circumstance that whereas fresh cases had been cropping up at the

rate of ten a day, twenty-four hours after the appearance of the posters no further cases occurred, and the epidemic ended as suddenly as it commenced.

There is a serious lesson that the outbreak teaches us:—An epidemic occurs, we find unhealthy cows, and from other very positive evidence we condemn the milk as the source of infection; and after 100 people have been exposed to suffering, and possible death, we are able to take measures to stamp out the disease. This is not as things should be. We should aim more at *preventing* the epidemic. At the present time practically nothing is done in this direction, and what is done is practically of no avail. Nothing short of a thorough and systematic inspection of all cows in every district at least once a fortnight, by someone who possesses a good knowledge of the diseases of cows, will suffice to protect the community from similar outbreaks, and to guard it against the greater, though more insidious, harm arising from the sale of milk drawn from the udders of tuberculous animals.

THE MONEY COST OF AN EPIDEMIC.*

By A. CAMPBELL MUNRO, M.B., D.Sc., M.O.H. of the County of Renfrew.

IN illustration of the pecuniary loss to the community arising through the prevalence of infectious diseases, I may be permitted to reproduce a statement of the approximate cost to the community of the Mid-Renfrewshire epidemic of enteric fever of 1893.

In the course of this epidemic, there occurred 859 cases, and seventy-four people lost their lives. I put aside any reflection with respect to the immense amount of bodily pain and suffering, the mental distress and anguish, the misery and wretchedness, involved in these figures. I confine myself to the pecuniary aspect of the question. Having before me an approximate statement of the wages earned by each individual wage-earner attacked in the course of the epidemic, together with the average period during which he was prevented by illness from pursuing his occupation, I am in a position to estimate the cost of the epidemic to the community through loss of wages at £3,291. There has next to be considered the expense involved in connection with the treatment of these illnesses, extending, on an average, over seven weeks. I find that the average cost of treatment for each patient received into hospital in the course of the epidemic was about £8 15s. I am, therefore, well within the mark in estimating the average cost of treatment of cases, over-head, at £5. It may be taken that, in respect of a large proportion of the cases treated at home, the cost

* From Dr. Munro's Annual Report for 1894.

of treatment was limited by the pecuniary capacity of the household. The cost of treatment upon this scale amounts to £4,295. £5 is the accepted estimate of the average amount incurred in connection with funeral expenses, and the expenditure arising in this connection falls to be set down at £370. Finally, we have to estimate the value to the community of the lives lost in the course of the epidemic. That human life has a distinct pecuniary value is a consideration which has probably never entered the mind of the average citizen. Nevertheless, the matter is one susceptible of actuarial demonstration. A quotation from the writings of Farr, the greatest authority on the subject, will best illustrate the position of the matter:—"As lands, houses, railways, and the other categories in the income-tax schedules are of value, because they yield annual returns, so, for the same reason, and on the same principle, the income of the population derived from pay of every kind, for professional or other services, and wages, can be capitalized; not precisely, it is true, unless the income of every person living were returned at least as nearly as incomes subject to income-tax; but sufficiently near to the true value to show that the value of the population itself is the most important factor in the wealth of the country. . . . The capitalization of personal incomes proceeds upon the determination of the present value, at any age, of the *future annual earnings* at that and all future ages." The value to the community of an individual member is ascertained by deducting the capitalized future cost of subsistence of the individual from his capitalized future income. Proceeding upon these lines, Farr arrived at the conclusion that "the minimum value of the population of the United Kingdom—men, women, and children—is £159 a head; that is the value inherent in them as a productive, money-earning race." He estimated the value of the population of the United Kingdom, at the time he was writing, as equivalent to a capital sum of £5,250,000,000, while the "capital" of the country (using the term in its ordinary sense) amounted, according to Mr. Giffen's estimate to £8,500,000,000.

Adopting Farr's figures as a basis for the calculation, I have made a rough estimate of the value "inherent in" the persons who died in the course of this epidemic "as a productive, money-earning race." I find that it amounts to the very large sum of £13,540. So that the pecuniary loss to the community of Mid-Renfrewshire, arising in connection with the epidemic, amounts to the enormous total of £21,496! A consideration of these figures may well suggest the reflection whether any investment is calculated to yield a better pecuniary return than the expenditure involved in the operations of the Public Health Department, which have for their main object the prevention of epidemics.

Public Health.

CORRECTED DEATH RATES.

MR. SHIRLEY MURPHY'S elaborate report for the year 1893 contains a vast mass of information which will be of great value for reference by health officers. The parts of the report relating to the London life-table and to the influence of school attendance on the incidence of scarlet fever and diphtheria are given in another column. Our present remarks are confined to the subject of the corrected death rates in the various sanitary districts. Mr. Murphy has supplied the factors of correction necessary for correction for age and sex distribution. Thus, if the age and sex distribution had been identical with that of England and Wales, the death rate of the whole metropolis would have been 22·3, instead of 20·9 per 1,000; in Battersea the recorded death rate, 18·9, becomes 20·3; in Bermondsey 23·9 becomes 25·3, and so on. The smallest amount of correction is required for Greenwich, in which 20·6 only becomes 21·2; next are Mile End Old Town, in which 22·6 becomes 23·3; Plumstead, in which 16·4 becomes 17·0; Poplar, in which 23·1 becomes 21·9; Rotherhithe, in which 23·2 becomes 24·0; and Shoreditch, in which 25·6 becomes 26·6. The largest amount of correction is required for St. Martin's-in-the-Fields, in which 21·3 becomes 25·9; Strand, in which 30·1 becomes 35·5; City of London, in which 23·6 becomes 27·1; Hampstead, in which 13·0 becomes 15·0; Westminster, in which 23·6 becomes 26·7; Woolwich, in which 20·2 becomes 22·8; St. James, in which 19·8 becomes 22·1. In St. George's, Hanover Square, 16·2 becomes 17·9; in Chelsea, 20·0 becomes 21·3; in Kensington, 17·7 becomes 19·5; in Wandsworth, 15·2 becomes 16·2, and so on.

It appears that these figures would be slightly modified if the population of outlying Poor Law institutions had been included. Thus the corrected death rate of the Strand district becomes 32·7 instead of 35·5 by this additional correction. It is difficult to resist the impression that in this instance the distribution of deaths in hospitals to the respective districts to which they belong has not been completely carried out. Otherwise this district enjoys the unenviable notoriety of the highest death rate in London; St. Luke's, St. George's-in-the-East, Limehouse, and Holborn coming next in order of demerit.

In the interests of accuracy, it is very desirable that the factors of correction given on page 7 of the report of the Medical Officer of the London County Council should be generally used by metropolitan medical officers of health.