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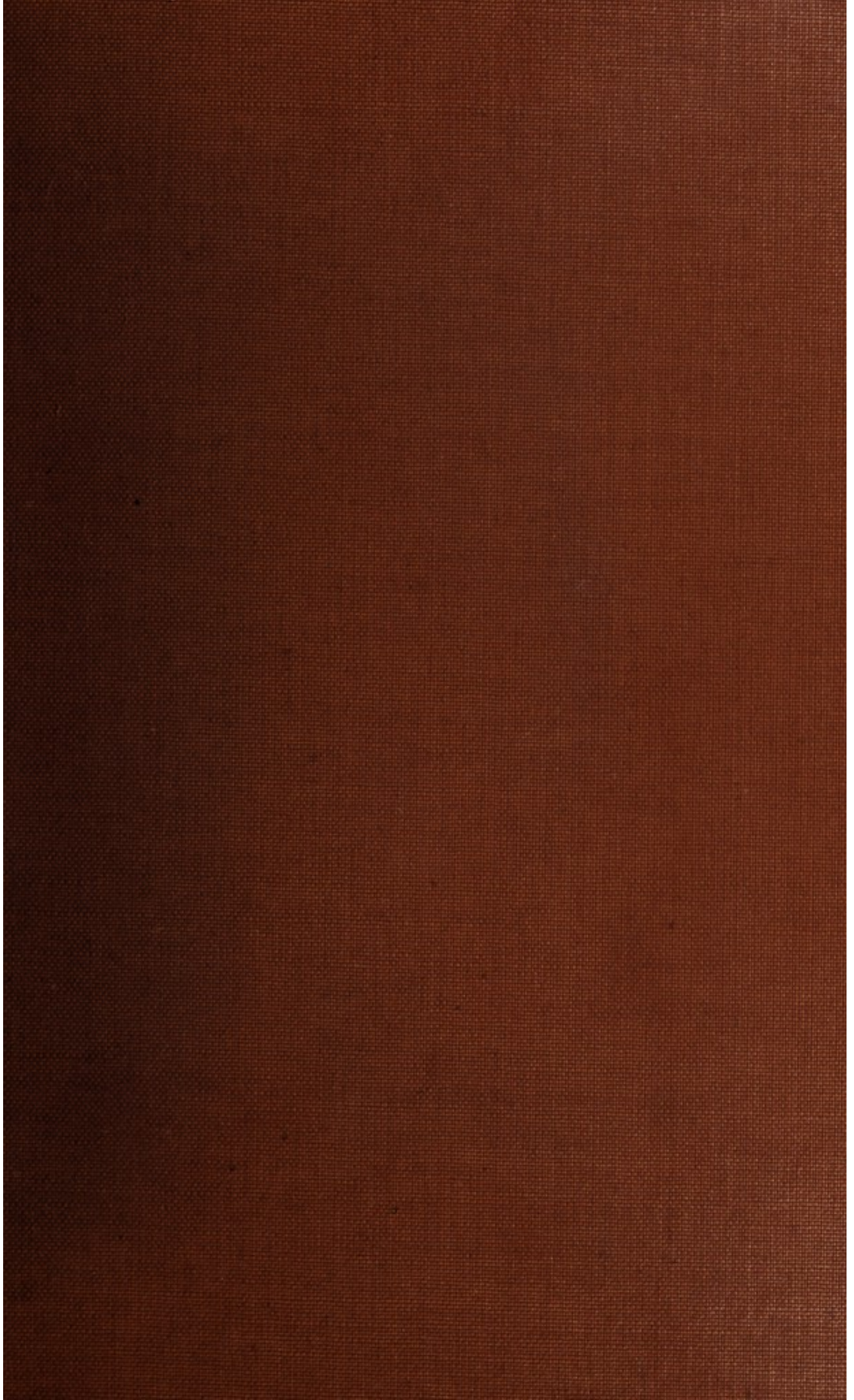
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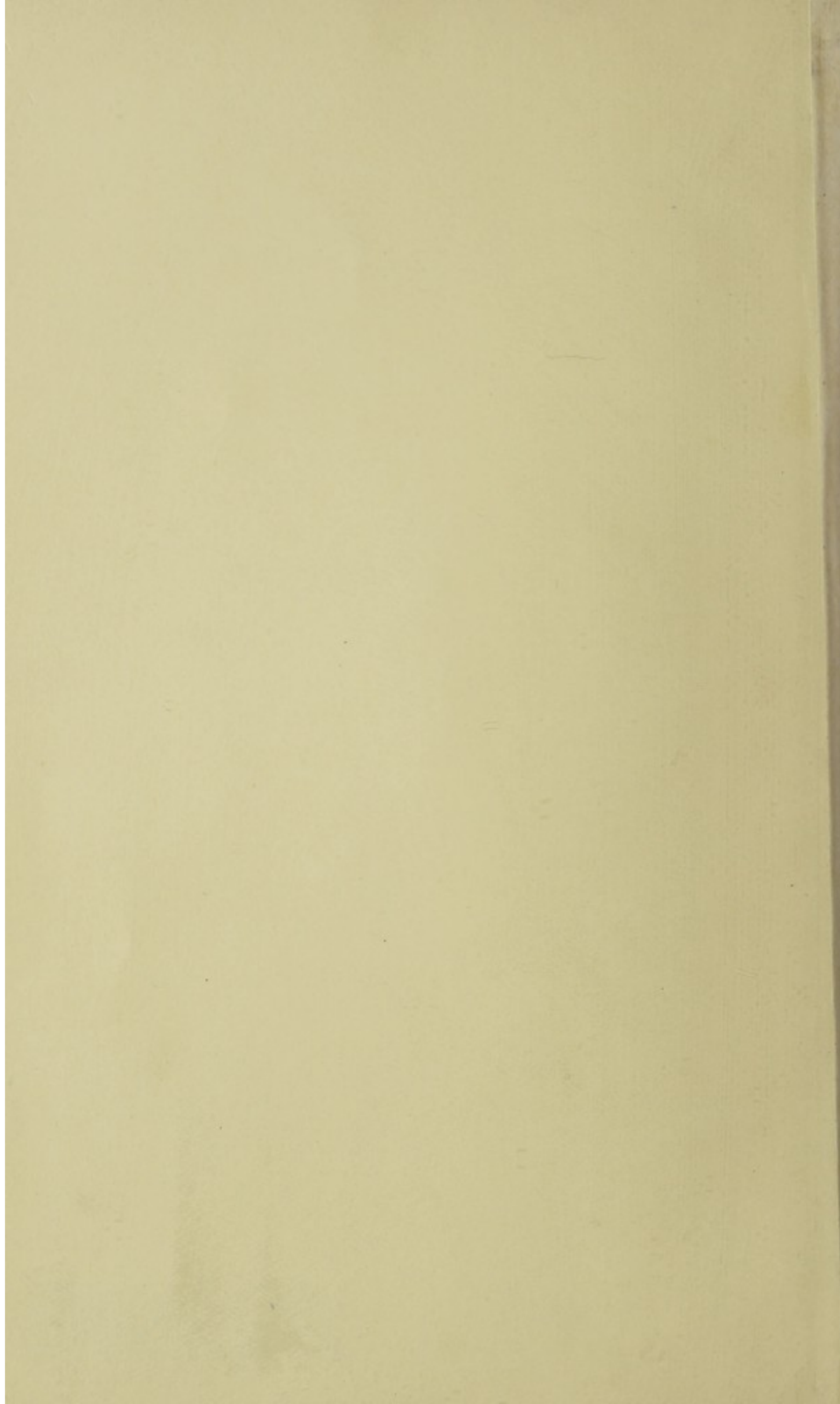
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CITY OF MANCHESTER.

OBSERVATIONS

ON THE

History of Public Health Effort in Manchester.

BY

JAMES NIVEN, M.A., M.B., LL.D.

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OBSERVATIONS

History of Public Health Effort in

Manchester



JAMES ZEPH. M.A. M.B. LL.D.

INTRODUCTION.

DEAR ALDERMAN JACKSON,—

The writing of this record is due largely to your warm encouragement. But I am rejoiced to furnish a chronicle of my activities in the service of the Manchester Public Health Committee since 1894, and also of the work achieved by that Committee in so far as I had any personal share in it. It must be admitted that it tells of an unfinished task, and in no one thing do I regret that more than in regard to summer diarrhœa, the destructive annual outburst of which is, I am convinced, due, largely, if not mainly, to the housefly, the suppression of which I regard as a perfectly possible task. The effort to achieve this suppression was begun in 1909, when byelaws were obtained, which appeared to render it attainable. But the practical difficulties of administration are often greater than they appear at first sight, and, although strenuous efforts have been made to solve the problem from that time onwards, the cunning insect has often eluded us, with the aid of its human allies. Amongst other consequences of our efforts, we were led to the necessity of preventing any undestructed organic matter being deposited on tips within the City. I have endeavoured to indicate how the suppression of the housefly may be accomplished, and still hope to see it carried through, so far as necessary. A great effort was made in 1921 to get nearer to the goal, with but partial success.

It appears to me that certain branches of Public Health work should come under the Medical Officer of Health as co-ordinating and directing head. Amongst these come first the work of the Cleansing Department, which needs to be directed in subordination to the sanitary requirements of the City, as interpreted by your adviser in public health matters. Equally is this true of the department which deals with unwholesome foods, a subject which is expressly referred, by the Public Health Act, 1875, to the Medical Officer of Health or to the Sanitary Inspector, which comes to the same thing. Certain unwholesome articles of food necessarily come under his administration, and the conditions

under which food is prepared and stored are and ought to be under him. In my opinion, all matters relating to unwholesome food should be in his department. The control of infectious disease and the sanitation of schools should similarly be placed under the Medical Officer of Health, as they originally were, in the same sense as the control of tuberculosis is under him.

I have nothing but praise for the manner in which my late colleague, Dr. Ritchie, carries out his difficult duties. But, at the same time, so long as any part of the control of disease is severed from the Public Health Office, there must be lack of co-ordination, and I do not see that the position of the School Medical Officer should be in any way impaired by such a change, or his usefulness. At the same time, there is much of his work with which the Medical Officer of Health would not need to concern himself closely.

Much of the work of the Sanitary Department was, until lately, carried out by officials who were independent of the Medical Officer of Health, and it was only during the last three years of my tenure of Office that I was administrative head of the Sanitary Department and of the Hospitals.

The Public Health Committee finally came to the conclusion that the Medical Officer of Health should be responsible for all the different parts of the work under their control, and it is indeed, difficult to see how otherwise he is to adjust the different parts of the machinery, so as to produce the best results for the Public Service. That this arrangement was so long delayed was due to the long and excellent service rendered by the late Mr. A. T. Rook, as Sanitary Superintendent.

It thus resulted that the efforts of the Medical Officer of Health were specially concerned with the new administrative developments required under protection of foods, housing, tuberculosis, maternity and child welfare, and venereal diseases. I trust that it will be clear how much I owed to the splendid staff of Medical and Lay Colleagues, who took part in this development. It has been always a pleasure to me to see any good piece of work done by them, scientific or administrative, and the occasions for such gratification have been numerous.

In the result, we can claim to have helped to build up an efficient and successful organisation, at as moderate an expenditure as circum-

stances permitted, and not without trial of various expedients before arriving at our present form.

Part of the development, viz., that relating to venereal disease has been imposed by the Ministry, and the rapidity of development under child welfare has also been due to the same cause. Tuberculosis has, perhaps, owed somewhat less to extraneous direction. At times during the war, the pace has been trying. Nevertheless, we have been able to give a local colour to the work, and one in accordance with local needs.

I would offer my congratulations to the Lord Mayor on arriving at an understanding with the Ministry of Health, which will permit a renewal of building, the most pressing need of the time.

May I offer you my renewed thanks for your support, when Medical Officer of Health, and my acknowledgment of the devotion with which you have served the public and inspired the fellow members of your Committee..

There is no doubt that you and your Committee would have been able to do much more for the amelioration of social conditions had the great war not placed such a tremendous load on National Finance.. What you have been able to do, these pages in some measure describe. They deal only with the work of the Public Health Office, and do not attempt to trace the influence on the public health of other sections of Municipal work, but that is not because it has been small. The task of doing so is at present beyond my strength or opportunities.

Yours very sincerely,

JAMES NIVEN.

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OBSERVATIONS

ON THE

HISTORY OF PUBLIC HEALTH EFFORT

IN MANCHESTER.

It will be found, I believe, that by far the most important influence which has governed the improvement of the public health in Manchester, apart from economic conditions, has been the removal of organic filth, whether without or within the habitations of the people.

Probably the next in importance has been the control of infectious disease.

No less weighty in their effects have been the economical factors and the consequent diminution of poverty, though it is not so easy here to trace cause and effect.

Much of the bad housing in Manchester is inseparable from the removal of filth. But bad arrangement, crowding, construction and planning of houses bring evils of their own which require separate consideration.

Improvements of a positive character, such as the institution of parks, the physical care and training of children, the provision of public baths and wash-houses, have also contributed much.

The provision of an abundant and pure water supply has been of capital importance, both directly and indirectly.

The provision of an abundant and varied food supply of good quality, and a knowledge of the modes in which it can be made accessible is also a prime factor in health.

The part played by education has been far from small.

It is proposed, therefore, to give a resume of the efforts made in many of these directions.

Statistics available to show the changes which have been occurring will, then, be indicated. Finally, some observations will be made on the needs of the future, so far as I can judge of them.

DIRT CONDITIONS.

The Annual Health Reports for the City of Manchester date back from the year 1868, when Mr. John Leigh was appointed the first Medical Officer of Health. He had been a practitioner in the City for a number of years, and was well acquainted with the conditions prevalent. He was, at the same time, a man of culture, and with great breadth of outlook. The City then consisted of the Sanitary Districts still known as Ancoats, Central (Deansgate, London Road and Market Street), St. George's, Hulme, Chorlton, Ardwick, and Cheetham, and the estimated population in 1869 was 345,295. It contained the oldest and least sanitary parts of the present City.

The area does not appear to have been altered since the year 1832 up to Mr. Leigh's appointment, nor did the annual death-rate materially change during that long period, over which it remained at about 32 per 1,000.

Old Manchester must have been a strange place for the poor to live in. He observes (page 5, Report for 1869):—"So numerous were the inhabited cellars in Manchester a few years ago that it might well have been considered a city of cave dwellers."

The houses were frequently gathered round courts entered by a ginnel, and the smaller streets were frequently blocked at one end. In Hulme, indeed, then, as in 1894, many of the back passages were narrow and blocked at both ends. The excreta were collected in midden privies in the courts at the ends outside the houses, and in the narrow back passages behind houses. Often as many as six to eight houses were served by one privy. The conditions must have been well-nigh unendurable. In order to alleviate some of the evils the Council separated the dry from the wet materials, and the urine was collected in cesspools. Mr. Leigh estimates that had the contents of these cesspools been collected in one place, they would have formed a lake 5 ft. deep and 16 times the area of St. Ann's Square.

In the case of back-to-back houses the midden privies were placed between or at the end of the double row of houses.

It is needless to say that, under these conditions, infectious diseases and sepsis were rife.

Up to 1890 there were no effective building byelaws, and the houses were for the most part crowded as tightly as they could be packed, though, in some districts, notably in Hulme, they abutted in many instances on large streets. Mr. Leigh's first 10 years of office were, therefore, spent in dealing with the midden privy system. Apparently he must have concluded that there was not enough water for water-closets. At all events he devised what promised to be a very complete pail-closet system to replace the middens, and both the middens and the

cesspools were abolished. For a time this proved a very great improvement. Unfortunately, the structure of the containing chambers was unsound at the base, and the pails sank, leaving gaps between them and the closet seats. To remedy this, strips of metal were fixed to the seats called urine guides. These in turn got corroded, and the ground became polluted as before.

In many places Mr. Leigh showed that the passage drains were blocked with silt, and, in fact, the ground about the houses was soaked with impurities.

The houses prior to 1890 were without damp-proof courses, and, under the influence of the warmth within, the contaminated water of the subsoil soaked into the interior through the walls.

The pail-closets which Mr. Leigh planned were provided with a cinder sifter, so that a layer of fine ashes might fall on the excreta. But sufficient allowance had not been made for the imperfections of the inhabitants, and the cinder sifter was neglected.

However, the midden privies and cesspools were abolished over a series of years, and, for a time at all events, the health of the population was much improved.

In 1894 I found that the new system had become not much better than the old, so far as nuisance and health were concerned.

But, in addition to collecting the excreta, Mr. Leigh seems to have had a good deal to do with devising the arrangements for treating the excreta at Holt Town so as to produce a saleable manure.

Moreover, the Public Health Committee, now the Cleansing Committee, purchased estates at Carrington Moss and Chat Moss, on which they deposited part of the contents of the pail-closets, and which they reclaimed for farm land.

Mr. Leigh was also much occupied with the setting up of a system of district inspection, and with provisions for the disinfection of clothing and houses. At that period, 1868, infectious diseases, including small-pox and typhus, were prevalent to an extent of which we have now no conception.

The Royal Infirmary had established Monsall Hospital, and advantage appears to have been taken of that branch of their activities, judging from the number of deaths which are given as having occurred at Monsall. Many cases were also treated in the Union Hospitals, and apparently also in the Infirmary. A few years later, advantage was also taken of the accommodation at Pendlebury Hospital. The Corporation themselves, however, at that time, did not treat infectious illness.

These were the principal activities of Mr. Leigh, though about 1878 he addressed himself to the housing problem. After carefully weighing

the different lines of action possible, he advised his Committee that most advantage would be gained by piecemeal alteration of houses, rather than by isolated schemes for the clearing of areas. He also advised the joining of back-to-back houses to form through houses, and the improvement of existing dwellings.

This was the policy afterwards adopted, in which I concurred on independent consideration of the circumstances. I do not think, however, that Mr. Leigh had worked out any plan of operations such as was inaugurated by his successor, Dr. Tatham, and afterwards extended and improved.

Mr. Leigh had a stupendous task before him, and addressed himself to it in the only manner in which he could have accomplished what he did, by attacking the most urgent questions with all the means then at his disposal. Nor was his success by any means small, as may be seen in the statistical sections of his reports, or of any recent Annual Reports.

In one way he effected a great improvement. By the introduction of the pail-closet system, and through consequent treatment of excreta, he did away with the need for tipping the contents of middens. There can be little doubt that tips so constituted are, for a great number of years, dangerous to the occupiers of the houses or works sure to be built upon them sooner or later.

The conversion of midden privies into pail-closets extended from 1872 to 1883, and was most active from 1875 to 1880. The details are given in the Reports of the Cleansing Committee, or, as it was then called, the Public Health Committee.

To complete the story of the closets, when I came to Manchester in 1894, the pail-closet system had failed very largely to do what had been expected of it. The narrow passages and courts were again such as Mr. Leigh described them, the air oppressive and malodorous, urine trickling on to them from within the closet chambers, their surface full of rises and falls from defective and soaking drains, and the surfaces imperfect, so that foul liquid was soaking into the soil. The subject was once more taken up, and a movement was made towards the conversion of pails to water-closets. In this matter I received great assistance from Mr. William Stansfield, of the Sanitary Department, and from Mr. Rook. Mr. Stansfield's remarkable report did much to force on the conversion to water-closets, by showing that the existing system was extravagant.

The conversion of pail-closets to water-closets has entailed other and no less important improvements in connection with the removal of filth from dwellings. When this alteration was carried out, it became necessary to examine, and, if necessary, to reconstruct the house drains. This, in its turn, entailed the repaving of yards, many of them defective

and pervious. At the same time the passage drains were reconstructed and the passages repaved.

By these means the whole of the drainage and of the surfaces near dwellings were reconstructed.

It thus came about that most of the foul matter formerly soaking into the ground near houses has now been diverted into the sewers, while at the same time the subsoil has been rendered dry. The possibility of inserting damp-proof courses in the old houses has been considered and rejected, though these improvements have done much to diminish the ill-effects of their absence.

These consequent alterations have entailed an amount of work not less than that expended on the conversion itself, and the Public Health Committee may well be proud of the change which over many years they have effected on the face of the City.

The presence of organic decomposing matter within the houses, in so far as it is conditioned by the insoakage of filth from without, has been greatly circumscribed by the above means. But houses get dirty from within, also, though probably not to so dangerous an extent.

This nuisance is partly met by the operations of the disinfecting staff, who cleanse and disinfect under notice from the Health Department, not only where there is infectious disease, but also where a house has been allowed to get dirty. The infectious diseases which determine disinfecting notices are chiefly tuberculosis, scarlet fever, diphtheria, erysipelas, and enteric fever. Up to the present, disinfection has been carried out by washing with a dilute solution of chlorinated lime, which should be a very thorough method if carried out according to instructions. In this way, also, not only is cleansing effected, but infectious matter is destroyed. It is, however, in many cases a great hardship, as the tenant cannot afford to re-cover the walls.

Mr. Leigh employed a staff of whitewashers, but it is practically certain that the present race of householders would not accept white- or rather lime-washing.

A vast number of houses are infested by bugs. None of the methods hitherto advocated would seem to meet this plague, which is especially violent in the older parts of the City, as, for example, in Hulme and the Central Districts.

These bug-ridden houses are, many of them, not fit for human habitation, but in the present dearth of houses it will be impossible to get all of them condemned. The only way to cure the evil is to get a large number of new houses erected of a suitable character, with simultaneous removal of the older houses.

Another inheritance from the past is the presence in the City of a number of tips, public and private, on which a vast quantity of organic

refuse is deposited. They harbour rats and breed flies, as has been amply proved in the case of the Harpurhey and other tips. The organic matter decomposes and the dried dust is carried long distances in windy weather, often borne along on the surface of sheets of paper. In this way sepsis must be widely dispersed. The organic matter also takes fire and burns with a most offensive stench, though this is the least part of the evil. I reported on this subject in the Annual Report for 1920. I am of opinion that the deposit of organic matter on tips within the City (paper, rags, bones, horse manure, vegetables or house ashes containing them) should be forbidden under a penalty, and that sufficient destructors should be erected to destruct all organic material, including street sweepings, which cannot be at once removed quite away from the City.

No exact facts are available to show how the night soil, ashes, street sweepings, and other refuse are disposed of. The statement furnished by the Cleansing Department is not capable of sanitary interpretation. What is needed is a precise and detailed quantitative account of how the following are disposed of finally :—

1. Street sweepings.
2. Night soil.
3. Market garbage and other vegetable refuse.
4. Horse and other manure.
5. Fish refuse.
6. Slaughter-house refuse.
7. Domestic ashes, warehouse, etc., refuse.

Such an account would give the weight disposed of under each heading, and account for the final disposal of the amounts stated. The present statement is of no use for public health purposes.

Practically the headings we desire to know about are 1, 3, 4, and 6 ; but every item collected should be quantitatively accounted for according to its mode of disposal.

In my opinion, this Department should be under the Public Health Committee, should be supervised by the Medical Officer of Health, and should be worked primarily for public health purposes, as appears to have been the case in Mr. Leigh's time, who was, in fact, the head of that Department.

It is not only organic matter that is injurious to health ; the dust of the streets and the sharp dust produced in many mechanical processes are also highly injurious to the lungs, especially when mixed with organic debris. The cleanliness of the streets is, therefore, of great moment to the health of the City. It is astonishing how soon masses of paper accumulate in the streets, and how soon dust gathers on the pavements. It is also remarkable how soon a fine coating of dust gathers on the different surfaces of a house which is not constantly cleaned. We need to know, therefore, how street sweepings are not merely adequately removed, but

how they are disposed of after removal. It is most disquieting to find private deposits of dust and organic matter going on within the heart of the City, such as those mentioned in my Annual Report for 1920. It is not sufficient that such materials should be carted from one part of the City to another. I am not unaware of the difficulties of the Cleansing Department, but it is worth while enquiring whether tips should not consist exclusively of clinker and heavy dust, the lighter dust being directly removed to the estates of the Cleansing Committee along with all organic material not at present provided for by destructors.

An adequate and complete account should be kept of all refuse produced and collected within the City, with its final destination in method and site.

On consulting the statement of the Cleansing Committee in my Report for 1920, one finds that the storage of domestic ashes is on the way to be completely transferred from the old wooden ash boxes to closed tins. This is a decided improvement. The temptation is thereby much reduced to the pouring of liquid refuse into the receptacle for ashes. Perhaps, also, there is less danger of ashes being allowed to accumulate and overflow on to the yard surface, a condition which was in intimate association with the pail-closet system. But it is perhaps too much to expect that this will never occur. It is, of course, a question of administration.

BLACKS.

Another important source of nuisance is the emission of smoke into the atmosphere from the consumption of coal in the furnaces of industrial works, institutions, hotels, and private houses. The injury inflicted on health is very great, and is constant and cumulative. So far as health is concerned, the greatest detriment to health is, beyond doubt, the deprivation of light, and particularly of the actinic rays, which exercise a most potent effect in the destruction of the germs of disease. It was known, prior to the discovery of the tubercle bacillus, through the investigations of Dr. Downes, that direct sunlight exercises a rapidly destructive action on micro-organisms. Koch, Delépine and Ransome showed that this is true in regard to the tubercle bacillus, and it has also been demonstrated for many other micro-organisms, even for the resistant spores of anthrax.

The same action is exerted, though in much diminished degree and more slowly, by diffuse daylight, so that it may be said that every house is dependent for its health on the amount of sunlight which it receives.

This is no new conception, but has been familiar well over 30 years.

Notwithstanding its familiarity, its vast importance has been but little appreciated in practice. It is especially important to Manchester, which has been the prey of septic disease, tuberculosis, and pneumonia. In the section of the Annual Report for 1919 relating to meteorology, it will be found that Manchester comes very low down in respect of the number of hours of bright sunshine enjoyed, while in winter it is the lowest of the large towns.

The importance of this question of light had been already appreciated in 1881 and 1882, when an important research by Dr. G. H. Bailey, carried out with the collaboration of a number of Manchester citizens, gave numerical data for a number of different positions in the City, and showed that smoke was the principal means by which the penetration of light is intercepted. This research is published in the *Journal* of the Town Gardening and Field Naturalists' Society for those years, and deals with many interesting facts about smoke. It is concerned with the interception chiefly of the actinic rays—and with sunlight, therefore—as distinguished from sunshine. The interception of these rays is, however, concerned not only with the loss in destruction of bacterial organisms, but also with the equally serious loss of vigour which the population, and especially the young, suffer from the reduction of sunlight.

The subject has again been taken up and extended in a report prepared by the Air Pollution Advisory Board, and published by the Sanitary Committee in 1915, which, besides other valuable matter, contains the description of a new form of actinometer. Observations made with this actinometer confirm and give additional value to those made in 1881 and 1882.

The 1882 observations show that the actinic rays in the neighbourhood of large towns, *e.g.*, in Didsbury, have an activity only about equal to one-third of that shown in Torquay. It is, however, necessary to take into account the amount of cloud in the localities compared.

The loss sustained at the violet end of the spectrum has not only a great effect on health, but it is of the greatest consequence to vegetation, the growth of which is dependent on these rays. The diminution in value to agriculture near large towns must be very great.

A large section of the houses in the older parts of Manchester are, in any case, so arranged that they have an inadequate allowance of daylight, especially in the back portions of the house. But, owing to the quantity of smoke in the atmosphere, all suffer from deprivation of light. Where the rooms are actually dark, whether from faulty construction or smoke, they will not in general be so clean as they would be if there were abundance of light. This applies also to works.

This is a very great hindrance in the reduction of infective diseases, such as sepsis, tuberculosis, pneumonia, bronchitis, and others.

The deficiency of light might, to no small extent, be counteracted if there were increased activity in cleanliness. This is quite a feasible proposition, and an endeavour is made to act upon it in the case of tuberculous disease. Unfortunately, the general result of loss of light is the reverse. So far from increased effort being put forth to secure cleanliness, there is generally far less.

Then, again, that most precious commodity light could be to no small extent saved in other ways. If the walls of houses were limewashed instead of papered, with perhaps a dado in colour, or, in lieu, if very light papers were used, and if the yard walls were limewashed sufficiently often to keep them fairly white, a great saving in light would result. These improvements are desirable also as a matter of cleanliness. Mr. Leigh employed four limewashing inspectors, and the health visitors of the Corporation now endeavour to secure limewashing. But the aggregate result is little compared with what is required.

The dirt that comes from smoke is enormous, and a measure of it was obtained in the first of the researches mentioned above.

It is often so great in amount that people will not open their windows because the curtains, furniture, clothes, and surfaces get black. There is thus not that movement of air in houses which is necessary for health. Light and moving air are both powerful stimuli to increased vital activity. It is because of this stimulus to increased respiratory activity produced by air in motion that people living in the country have their superiority in respiratory capacity. Smoke or other dirt which hinders the movement of air in houses is thus, from this cause, an enemy to health, especially to those living chiefly indoors.

It disfigures public buildings in a manner not easily remedied. The soot emanating from chimneys carries with it, besides black, carbonaceous, matter, a tarry substance and a certain amount of sulphuric acid. The tarry substance causes the blacks to adhere and sinks into the substance of stone, while it deposits sulphuric acid on mortar and causes it to perish. Buildings are thus decayed as well as darkened. It is a very costly business to keep public buildings in a presentable condition.

In the same manner it causes a great amount of expense in connection with the cleaning of fabrics, renewal of papers on walls, painting, and cleaning of various kinds. In a pamphlet issued by the Air Pollution Advisory Board, it is estimated that the domestic wash bill in Manchester costs £250,000 more per annum than it would if the inhabitants lived in Harrogate, and that is only a portion of the increased expense.

There is also a great expense in the fuel thus wasted, and which would be saved by complete combustion. In the case of industrial works, the saving should be effected within a fraction of the waste, and though in the case of the domestic fire so much could not be said, it is certain that

a large portion of the fuel wasted might be completely consumed by proper management of the fire. On every account a little more elementary education in the management of fires, industrial and domestic, would be well bestowed.

In certain conditions of the atmosphere, fogs are produced, and help to confine the sulphurous acid, especially that given off from domestic fires. Probably smoke alone would produce fogs, but any minute articles of dirt in the atmosphere will serve the purpose. If the fog is of such a character that sulphurous acid is seriously penned up in the lower portions of the atmosphere, persons suffering from bronchitis or having sensitive mucous membranes are apt to suffer severely. In the Annual Report for 1919 I have given figures tending to show that, in the aggregate, fogs raise the mortality from phthisis, and still more that from other forms of pulmonary disease. But by no means all fogs have this effect, and it is difficult to account for the differences shown. Probably, however, those which are attended by decided imprisonment of sulphuric acid are the worst. Further, if a fog coincides with a period when respiratory disease is already prevalent, the particles of fog will attack the germs and serve to convey them from one person to another.

The researches already quoted show that soot exercises a very deleterious effect when it falls on leaves, blocking up the pores, depriving the chlorophyll of light, and acting directly on it by its acid contents. Hence, no doubt, the early period at which leaves in this district wither and fall. Under ordinary circumstances it is doubtful whether any such action takes place on the human lung.

It is doubtful whether the lungs suffer in the course of ordinary breathing and in the absence of fogs, except in the case of mouth-breathers. Probably the nasal mucous membrane usually suffices to intercept injurious particles, though the frequency of troublesome nasal catarrh suffices to show that the matter so intercepted is noxious in its effects. This is a really serious malady in this district.

Attention is once more directed to the injuries inflicted by smoke, since a realisation of these is essential to secure fresh efforts to deal with the smoke nuisance.

Manchester has always, during the last 30 years or more, endeavoured to do its duty as regards industrial smoke, and has maintained an adequate staff of smoke inspectors to take observations with a view to the enforcement of the law as contained in the Public Health Act, 1875.

The late Mr. A. T. Rook was an enthusiast in the matter of smoke abatement, and with rare exceptions conducted the cases in court when proceedings were ordered by the Sanitary Committee, which he did with great judgment. In 1896, at the instance of Dr. G. H. Bailey,

the Sanitary Committee requested Mr. R. M. Rowe to act as a smoke inspector in the capacity of a technical expert, and more recently they have placed him at the head of the Inspectorial Staff in connection with smoke. In this position, his wide acquaintance with industrial processes, and his knowledge of chemistry, have been of the greatest value. The Committee have, in fact, taken every precaution to ensure efficiency in the work of smoke inspection. They have preferred to take action under that clause of the Public Health Act, 1875, which makes it an offence for a chimney, not being the chimney of a private dwelling house, to emit black smoke in such a quantity as to be a nuisance, believing the section which defines it to be a nuisance when a fireplace or furnace does not, as far as practicable, consume the smoke arising from the combustible used therein, to be too troublesome to work.

The result of their continued efforts has, undoubtedly, been a marked reduction in the amount of black smoke emitted by industrial chimneys.

The Public Health Office records show an average annual number of days of fog of 41·6 in 1891 to 1900, 23·4 in 1901 to 1910, and 9·2 in 1911 to 1918, but it is difficult to accept that these figures can represent similar estimates. At all events, the last figure does not agree with that given in the report of the Air Pollution Committee for 1915. There has also been a marked reduction in mortality from respiratory disease.

The efforts of the Sanitary Committee to produce a better atmosphere have to no small extent been thwarted by the fact that they are surrounded by smoke-producing neighbours who have not adopted so high a standard in dealing with industrial smoke.

Nor has the law been always strictly administered either by the Sanitary Committee or by magistrates.

Nevertheless, the steady pressure of the Public Health Authority has already produced many improvements, to the benefit of the manufacturer as well as of the community, and public opinion has become ripe for further action.

A Departmental Committee was appointed in 1914 to hear evidence and devise proposals. Evidence was given before this Committee by Alderman W. T. Jackson, on behalf of the Manchester Public Health Committee, and these proposals were put forward by him :—

“ In dealing with the nuisance, when common to the areas
 “ of several adjoining authorities, Joint Boards should be set up.
 “ It should be made obligatory on such Joint Boards to appoint
 “ whole-time inspectors. Inspectors should be appointed by the
 “ Local Government Board to supervise the work of the above
 “ inspectors, and to take action should the Joint Boards fail to
 “ discharge their duties. All smoke proceedings should be taken
 “ before a stipendiary magistrate, or where there is no stipendiary
 “ magistrate, by the County Court Judge of the circuit in which

"the area is situate. Penalties should be made adequate. The word 'black' in the Public Health Act, 1875, should be omitted, and provision should be made for controlling all degrees of smoke."

Mention is also made of the appointment of the Manchester Air Pollution Board in 1912, which has since done great service in connection with the scientific aspects of black smoke, the cost entailed, and the most suitable kinds of fireplace for private houses.

In the same direction as the above proposals are those placed by the Sanitary Inspectors' Association before the Reconstituted Committee in 1921, with the exception that the omission of the word "black" is not directly advocated. They propose, in effect, to substitute "dense" for "black."

It appears to me simpler to omit the word black, and that provisional standards should be set up by the Ministry of Health. Their suggestions cover many other points which it does not seem necessary to discuss here.

The Departmental Committee have, in their final report, given comprehensive proposals, which appear to be adequate. Their second proposal, *re* industrial smoke, that there should be on all employers obligation to provide the best practicable means, does not appear to have any reference to furnaces as mentioned in the Public Health Act. It would appear to cover the provision of a skilled and trained class of stokers.

There is no clause amongst the proposals put forward constituting smoke, or even black smoke, a nuisance.

It seems to be agreed that all the industrial processes carried on in Manchester could be conducted without nuisance from smoke; at all events, not more than is at present conceded.

If that is the case, smoke should not be produced, and it should remain an offence to produce it.

The question appears to be whether, if this clause is eliminated, greater progress will be made under the new proposals.

There can be no doubt that they will make local administration more difficult, especially as no proposal is made with regard to the status of the magistrate deciding on the question of practicability.

In all other respects the proposals put forward represent an advance, but the elimination of the clause constituting the production of black smoke a nuisance requires very careful consideration.

It would appear as if improvement would have to come chiefly from other directions. The education of the public, such as is now being given by the Air Pollution Advisory Board and by other researches, the education of the stoker, education by lectures on the laws of com-

bustion and on the management of domestic fires, reduction in the cost of gas, the supplanting of coal fires by gas for the production of power and metallurgical processes, promise to effect an advance. This, however, is not a cure, which can only be effected by a supply of electrical energy.

One cannot help thinking that it is important to retain the power to constitute industrial smoke a nuisance. As a matter of fact, we already have the clause as regards practicable means, so far as it is needed for the protection of the manufacturer, since the question of practicability cannot but enter into the hearing of a case, at least, so far as the infliction and amount of penalty are concerned.

It appears very clear that nuisance from smoke of a noxious character is not covered either by the clauses relating to the best practicable means or by the clause dealing with the emission of black smoke so as to be a nuisance. Thus the serious nuisance arising from steam motor wagons is not covered by the obligation to use the best practicable means, since it is largely caused by default of the driver. The equally serious nuisance of smoke, often charged with sulphurous gases, discharged from small works near houses, or from offices on the same level with other offices, works, or houses—smoke often wafted into neighbouring windows—is also not covered by either clause, at least, not effectually, and the only way to get rid of this nuisance would seem to be to abolish the use of coal fires altogether.

The Committee do not propose to deal directly with the nuisance from the chimneys of private houses, and it might be difficult. But it is doubtful how far it will be possible to compel the manufacturer to remove that part of the nuisance caused by him, if the moiety produced by cottage houses is left alone. Whether it be introduced as a separate Bill or not, I am of opinion that proceedings should be taken in respect of the chimney of any private dwelling-house proved to emit smoke for a stated period, say, of not less than 10 minutes within any half hour.

The above appears to be the chief dirt conditions of importance to the health of the community, though, no doubt, there are many others of a partial character which need and receive attention, such as the presence of rats and mice about dwellings, especially of those rodents which come from tips, slaughter-houses, knackers' yards, etc., also those which haunt food stores, restaurant kitchens, and other places where they can have access to food supplies; any impurity or lack of cleanliness in the making of sausages or potted meat; failure properly to cleanse eating or drinking utensils in restaurants and public houses; the failure to take proper measures to render the manure from animals innocuous, or to take adequate steps for the same purpose in respect of offal, etc., etc. Important as some of these are, they can be dealt with piecemeal, and they are not of the same magnitude as the dirt nuisances already discussed. Dirt nuisances must always remain of capital importance for public health.

INFECTIOUS DISEASES.

By the Public Health Act, 1875, Sections 120-133, a local authority may make provision of a proper place with all necessary apparatus and attendance for the disinfection of bedding, clothing, or other articles which have become infected, and may cause any articles brought for disinfection to be disinfected free of charge. They may provide an ambulance or ambulances. They may also provide a hospital, and charge for maintenance. They may give notice to the owner or occupier of a house requiring him to disinfect the house and articles therein likely to retain infection, and, in default, they may carry out the disinfection themselves, and recover the cost. These powers, however, are compulsory only in the case of infectious disease, which in the absence of any special regulation is to be held as meaning a disease compulsorily notifiable. A person suffering from a dangerous infectious disorder, who is without proper lodging or accommodation, or lodged in a room occupied by more than one family, or is on board any ship or vessel, may on certain formalities being complied with, be forcibly removed to hospital, and may, under the proper procedure, be detained there.

These clauses, then, contemplate dealing with dangerous infectious disorders in these ways :—

1. Isolation in hospital,
2. Disinfection of clothing, etc., and
3. Disinfection of the house and furniture.

Should, however, the patient remain at home, a penalty is imposed on the exposure outside the house either of the infected person or of infected things. There are other protective clauses in Public Health Acts which need not be specified. These contemplated the provision of a disinfecting station, and arrangements were made at 299, Oldham Road, by the provision of a hot-air oven, which was at first regarded as adequate for the purpose, though doubts of its efficiency for bulky articles soon arose, and were confirmed by Dr. Parsons' investigations. It was shown that machines of the type of Manlove and Alliott's, Washington Lyon's, Goddard Massey and Warner's, properly used, were adequate for all purposes, and steam could be made to penetrate to the heart of the bulkiest articles. It was also shown by Koch that current steam was equally efficient, and it therefore appeared to me that, if a steam pipe of 1½ in. diameter were led into the hot-air oven already provided and steam introduced from the works boiler at Oldham Road, disinfection could quite well be carried out. Professor Delépine showed that the essential condition for complete efficiency was the complete expulsion of air from the oven and from the articles to be disinfected, a condition which could be determined by means of a pressure gauge.

This was amply secured by conducting steam into the chamber for half an hour, and the completeness of disinfection was proved by the

severest tests applied to bulky articles. It is doubtful, however, whether complete expulsion of air is now secured, as the chamber has gradually undergone disrepair, and it is desirable that permanent machines should be provided with suitable arrangements for storing infected and disinfected articles.

Disinfection of leather, furs and books was carried out in a formic aldehyde chamber, in which formic aldehyde was, at the suggestion of Professor Delépine, generated by the formogène Richard lamp. Formic aldehyde is now generated in a Lingner appliance.

The disinfection of houses was carried out by materials which were used to wash the walls and furniture, giving off chlorine and hypochlorous acid. In fact, no alteration was made except that, as the result of investigations by Professor Delépine, a solution of chlorinated lime was used instead of the materials previously used, which may themselves have been suggested by Professor Delépine. The chlorinated lime is bought under a guarantee, but in addition the chemist of the Cleansing Department tests every jar of solution sent out to determine the amount of available chlorine. One precaution is needful. The strength used was at first 1 per cent of chlorinated lime of guaranteed and tested strength. This was increased to 2 per cent, as it was found that, when about half a bucketful had been used, as a rule the available chlorine had sunk to one half, owing to organic materials introduced by the brushes. The second half of the solution is thrown away. The dilution of the material is entrusted to the men, who require some watching as they tend to make the solution too weak. In carrying out this process the operator is supposed to keep the windows open.

A 2 per cent solution of formalin may be substituted, and may be sprayed on surfaces, or gaseous formic aldehyde may be used if it is not desired to strip the papers, etc. This may be obtained by Lingner's appliance or in any other way which does not result in the rapid formation of paraform.

The ambulance service is adequate. It is desirable from time to time to ascertain that disinfection of the ambulance is secured after carrying a patient before another is conveyed. The conversion at an early period from a horse to a motor ambulance system was due to the initiative of Councillor Pierce.

I am of opinion that an ambulance and disinfection station, and also a meteorological station, should be erected at Monsall Hospital for these reasons. It is doubtful whether a proper disinfecting and ambulance station can be provided at Oldham Road yard.

In disinfection much depends on the careful selection of an adequate staff and on their supervision, and it is desirable that the Medical Superintendent at Monsall Hospital should have the supreme control, under the Medical Officer of Health. The present arrangements are expensive,

and it is desirable that an effort be made to cut them down. The expense lies chiefly in the department of house disinfection. This, however, cannot be varied or modified, except under the direct observation and control of the Medical Officer of Health, nor without some trouble.

The Meteorological Station, at all events, should be moved to Monsall Hospital, where there is a suitable site for it.

There is one advantage at Oldham Road, cheap steam. Should the Committee decide to erect a new station in that position, I think an arrangement should be made to have more direct control of the disinfecting operations than has hitherto held. In order to modify the existing arrangements, to follow the shifting processes, and to control expenditure, a well-paid responsible man with knowledge of the processes is required, who would have entire charge of all the arrangements and accounts.

It is, of course, necessary to have a good system of disinfection and ambulance work, but of much greater moment is a good system of investigation of disease, and of proper measures for arresting its conveyance by infected persons or other agents.

This is peculiarly the province of the Medical Officer of Health, and depends on him. No general rules can be laid down. But he can be much assisted by inspectors whom he has properly trained, such as Inspector Hewitt, Inspector Priestley, and the three Special Inspectors. It is always the weakest part of the defences, and considerable use can be made of good men for guiding others less alert or less well-informed as to the dangers.

A very important, in fact, an indispensable part of public health administration, is the notification of cases of the different infectious diseases over which the Public Health Department exercises control. The obligation of making such notifications in the case of a list of specified diseases is, by the Notification Acts of 1889 and 1899, placed on the medical practitioner in attendance and on the heads of families. Practically, this obligation rests on the medical practitioner. A further step was taken by Dr. John Tatham while Medical Officer of Health for Manchester prior to 1893. He conceived the idea of a scheme of mutual protection between Manchester and neighbouring towns, and for that purpose collected statistics of notifiable disease and distributed them to the towns willing to assist by sending him particulars of the diseases notified in them. The great value of this proceeding at epidemic periods is manifest. Dr. Newsholme, for the Local Government Board, extended this protection to the whole country, and since that period weekly returns of notifiable disease have been collected and issued to the different sanitary authorities in England and Wales. These returns are valuable, not only for the intelligence which they furnish

to every authority of danger to which they are exposed and for which they should prepare, but also because these returns may be made instruments of research into the habits of the diseases with which they are concerned. The notification weekly returns are still continued, but quarterly and annual summaries are now incorporated in the quarterly and annual returns of births, deaths, and marriages, published by the Registrar-General.

It is only necessary to refer to any one of the older Annual Reports on the health of Manchester to find in the statistical summary for Greater Manchester since 1871, a picture, so far as figures can furnish it, of the former condition of Manchester in respect of infectious diseases.

From 1871 to 1880, smallpox, typhus, enteric, continued fever, scarlet fever, and diphtheria were rife, and diarrhœa with English cholera visited the City very severely. Measles and whooping cough were more fatal than they have been in recent years. Scarlet fever was especially fatal.

The inadequacy of accommodation for the reception of cases was the subject of frequent comment on the part of Mr. Leigh. By a private Act of Parliament passed in 1852, the old House of Recovery for such cases passed into the hands of the trustees of the Royal Infirmary, and that body continued to receive cases of fever up to the period when they acquired part of the present site of Monsall Hospital, and proceeded to erect buildings for the isolation of infectious cases; cases were being admitted so far back as 1871.

Up to that period they appear to have been treated in the Poor Law Infirmarys and also in central buildings belonging to the Royal Infirmary.

Ordinary cases of fever were admitted to these buildings under contract with the Infirmary, the trustees, by an Act of 1882, being under an obligation to provide 80 beds. There does not appear, however, to have been any special obligation to the City, and the beds actually provided were divided between a number of local authorities, so that the wards were liable to be, and were, at times, much overcrowded.

In 1892-94 an outbreak of smallpox prevailed, and towards the end of 1892 an alarm arose on account of the presence of cholera in a ship arriving at Gravesend, and the arrival of contacts in Manchester, who proved difficult to trace.

The Corporation of Manchester, therefore, erected two wooden pavilions for the reception of cases of cholera on land adjoining Monsall Hospital, which they rented from the Dean and Canons. For the treatment of smallpox they also provided on the same area, which they rented for the purpose, 3 new wooden pavilions, each containing 24 beds, an administrative block, also of wood, and a laundry; and entered into an arrangement with the Royal Infirmary for the medical administration to be carried on by their staff at Monsall Hospital.

MONSALL HOSPITAL.

The Infirmary Board had previously expressed their willingness to transfer Monsall Hospital to the Corporation, subject to their obligations to other sanitary authorities, but nothing came of the suggestion at that time.

In 1894 I came to Manchester, and shortly afterwards a remarkable sweep of smallpox affected the houses round Monsall, and especially those facing the hospital on the north west, but separated from it by a valley.

Pursuing a manœuvre already found very successful at Oldham, I advised the removal of acute cases to Clayton Vale, convalescents only remaining at Monsall. This was promptly carried out, with a like result.

But it was felt by the Infirmary Board that they had not been sufficiently consulted, and, on the other hand, the Corporation felt that they should be in a position to act quickly in emergencies. An understanding was, therefore, arrived at, and Monsall Hospital was transferred to the Corporation by Act of Parliament in 1896.

At that time there was already no inconsiderable provision for the treatment of fevers in the portion belonging to the Infirmary, which contained an administrative building for the medical staff, a nurses' home, and accommodation in various blocks, including an isolation block for 8 beds. The total number of beds was estimated at 299 at the time of transfer, on the basis of 2,000 cubic feet per bed.

Steps were speedily taken to extend and improve the hospital.

	a.	r.	p.
The old site of Monsall Hospital covered	13	3	12
The area on which the wooden pavilions stood	11	2	32
But in addition the Dean and Canons had given the Corporation a strip fronting Monsall Road	3	1	37
There was also an area to the north which it was thought desirable to acquire	13	2	0
Total	42	2	1

This was considered necessary in view of future extensions, and also to protect the hospital on the side of Moston Brook. It was decided to acquire the whole of this area.

It was at once discovered that extensive alterations and improvements were required, and a scheme was put forward in 1898 for the most necessary alterations and additions, which included two isolation wards, new dining halls and kitchen, an annexe to the nurses' block, a new block for servants, additions to the laundry, a brick boundary wall, and fences, laying out and planting the site, the estimate being £27,500. The reorganisation of drainage and of the arrangements for heating

and other portions of the work, however, proved so extensive that a subsequent application for a loan of £14,500 was made and granted.

When smallpox declined in 1895, the smallpox pavilions were no longer required, and three of them became available as convalescent wards for cases of scarlet fever.

In 1902 the number of beds available was :—

Old Monsall blocks	291
Wooden pavilions	72
Isolation	24
Total	<u>387</u>

Subsequently, the wooden buildings were disused, mainly because, the site being a quicksand, and no sufficient account of that fact having been taken, the drainage became disorganised and the site became fouled. This entailed replacement, and two new convalescent blocks were erected—one for 32, the other for 48 beds—which brings the above total to 395 beds.

When the tuberculosis scheme was finally approved, it became necessary to provide at Monsall Hospital an equivalent to the beds taken at Baguley Sanatorium, and 4 pavilions for 24 beds each, plus an isolation block, were erected, bringing the accommodation up to 499 beds. This entailed extension of the annexe to the nurses' home to accommodate 28 more nurses.

In 1914 a crèche ward for 10 beds was opened, raising the total number of beds to 509. This number is on the hypothesis that each patient will have 2,000 cubic feet of space.

The cost of Monsall Hospital to the Corporation up to 1914 may be thus stated :—

	£	s.	d.
Payment to the Royal Infirmary	5,067	13	7
Purchase of land, etc.	8,442	18	1
New buildings and improvements	54,892	13	9
Total (1910)	68,403	5	5
Large pavilion	5,600	0	0
Crèche ward	900	0	0
Substitution scheme of 104 beds	20,600	0	0
Total (1914)	<u>£95,503</u>	<u>5</u>	<u>5</u>

But, in addition, there has been considerable expense in repairs. The total cost to the Corporation per bed now amounts to nearly £200.

There are, however, many individual faults to amend and improvements to make, which will be attended to by the housing manager,

Mr. Irvine, and made good by him under the instructions of the Public Health Committee, or referred by the Committee to the City Arc itect or other official concerned.

On the whole, Monsall Hospital has been a wise purchase, though, being an old institution, by no means an inexpensive one.

BAGULEY SANATORIUM.

When, in 1904, the Withington area was incorporated with Manchester, their recently-erected sanatorium for cases of fever became one of the City hospitals. Originally the buildings occupied an area of about 12 acres, with meadow land attached, situated on a gentle slope which was open to the north and west, but was partially sheltered to the south and east.

The whole site extends westward from this portion along Floats Road, the sloping portion adjoining which is about 8 acres in extent. Beyond these two portions lies a stretch of flat meadow land about 14 acres in extent. To the east lies a small paddock of about an acre, separated from the main site, which has an area of 34 acres.

The subsoil in the upper portion consists of shale lying on clay. The meadow land is clay of great depth. To the east the site is bordered by a streamlet, which runs into the Fairy Well brook, and receives the effluent from the sewage works. This brook in its turn goes into the Brooks' sewer, which discharges into the Mersey.

The buildings, when taken over, were new, the hospital having been opened in 1902. They consisted of 2 pavilions, each of 2 storeys, containing 12 beds on each storey, and 2 pavilions of 1 storey, containing 2 wards each of 10 beds. In addition, there was an isolation block for 8 beds, besides isolation rooms attached to the two-storeyed pavilions providing 4 isolation beds. Total 100. There were also an administrative block on the upper portion of the site, a farmhouse, damp and unfit for habitation, on the site of which is now the residence for the Medical Superintendent, an engine house and boiler, an electrical installation, consisting of a dynamo and accumulators for lighting the institution, a central heating system, a disinfecter, an incinerator, workshops, a laundry, and a mortuary. There were two approaches, one off Floats Road leading to the administrative building, and one in Dark Lane, leading to the engine room.

Under successive Medical Superintendents, the Fever Hospital fulfilled its purposes successfully, and the patients did very well. The one trouble was the installation for treating the sewage from the institution. This consisted of a septic tank, and 2 successive series of 4 contact beds,

worked automatically by a somewhat complicated system of levers, the effluent being discharged into the streamlet already mentioned after passing through a piece of land. Already in 1906 the machinery had got out of gear, and the engineers did not or could not rectify the defects. In 1908, Dr. Gilbert Fowler, on behalf of the Rivers Committee, proposed a number of improvements which were carried out, although the contact beds were never made to work quite successfully.

The National Insurance Act, 1911, led to the production of an extended scheme of treatment, under which 150 beds were proposed in addition to those already existing. The total of patients and staff were to number 400, and a greatly extended system of sewage disposal became necessary.

Dr. Fowler was again called in and proposed the conversion of 3 existing tanks into aeration tanks, the existing septic tank and contact beds to be used for the smaller night flow of sewage. In addition it was proposed, owing to medical difficulties raised, that the effluent should be distributed over a considerable area of land, and should be treated with solution of hypochlorite of soda before admission on the land.

With the exception of the last measure, Dr. Fowler's proposals were carried out.

It should be stated, however, that the process of aeration has never been entirely satisfactory except during the short time it was under his care. This was partly owing to the use of automatic filling appliances, and, as time went on, to faults in the distributors, which interfered with proper aeration.

Meanwhile, negotiations were proceeding with the Bucklow Rural District Council for the provision of a sewer in Floats Road. Unfortunately, negotiations conducted by them with Ashton-on-Mersey and Sale for the treatment of the sewage from their districts had fallen through, and though an enquiry was held, the Local Government Board refused to sanction the provision of a sewer in the absence of a scheme for subsequent purification of the sewage admitted into it.

Mr. R. G. Hetherington, one of the Engineering Inspectors of the Ministry of Health, on September 29th, 1920, presided at a Conference between representatives of the Manchester Corporation and of the Bucklow Rural District Council, and laid down the basis of an agreement, at the same time urging the Bucklow Rural District Council to produce a scheme for the treatment of their sewage, which they undertook to endeavour to do.

This has not yet matured, and in the autumn of 1921, complaints were received of pollution entering the Fairy Well Brook. In November, it appeared to me feasible to add chlorinated soda to the effluent in such

a manner as just to oxidise offensive matter, while sterilising the effluent, and I asked Mr. R. M. Rowe to work out a plan. In this he has been most successful, even providing for changes in the character of the effluent.

On 17th February, 1922, Mr. H. T. Calvert, D.Sc., Ph.D., visited the plant, on behalf of the Ministry of Health, and made suggestions by which it could be rectified and more fully used. These have been or are being carried out, though the difficulties have proved greater than they appeared at first and delay has thus been caused.

Nevertheless, the nuisance to the brook has probably been entirely remedied, and the effluent now complies with the requirements of the Rivers Pollution Board.

It is probable that the negotiations respecting a sewer have caused less continuous and less urgent attention to be given to the working of the existing plant than would otherwise have been the case. There can be no doubt that the provision of a sewer is the best remedy for the difficulties encountered. Failing this, the meadow land should be kept well drained and restored to its original use, and an adequate scheme for continuous aeration and sterilisation provided, with adequate staff to ensure successful working.

Little or no change occurred in Baguley Sanatorium until the Insurance Act necessitated the provision of a scheme for the treatment of cases of tuberculosis entitled to sanatorium benefit, and of other adults suffering from pulmonary tuberculosis.

The Public Health Committee had, in 1910, contemplated provision at Baguley Sanatorium of 200 beds for cases of tuberculosis, but, somewhat to their surprise, the Withington Guardians announced their intention to provide 400 beds, and declared that 200 was too small a provision for the Corporation to make. However, the Insurance Act defined the Public Health Authority as the proper body to make provision, as the Guardians were expressly excluded so far as insured persons were concerned.

In 1912, a Departmental Committee reported on the provision to be made in respect of tuberculosis, particularly so far as treatment was concerned, and recommended that the central portion of the scheme should be the dispensary, with the Tuberculosis Officer as its head, which should link up institutions and practitioners.

Accordingly a scheme was prepared which provided for the utilisation of the existing dispensary and Consulting Medical Officers of the Consumption Hospital, new offices being built by the Corporation on adjoining land for the whole-time Tuberculosis Officers and Staff of the Corporation. Baguley Sanatorium was to be extended to accommodate 300 patients, 100 male and 52 female patients to be treated in two new

blocks, which were erected according to plans drawn up by the Ministry of Health, who did not approve of the plans which the Corporation submitted.

Extensive charges were to be made to meet the requirements of the enlarged institution. Increased accommodation was provided for medical assistants, nurses and maids. Increased provision was made at the laundry, and in connection with lighting and heating. A dining-hall and recreation rooms were to be erected. Four day shelters were to be provided, etc., etc.

At the same time, 100 beds were provided at Monsall Hospital to accommodate the cases of fever displaced. The particulars are set out in the Report of the Finance Committee on the Sanitary Committee's proposed scheme for the treatment of tuberculosis, dated 29th May, 1913.

As this outline is intended only to show how the present accommodation came to be made, many particulars are not touched upon at all. It may, however, be recalled that a Medical Superintendent's house had to be built at Baguley Sanatorium, which was afterwards enlarged. The system of electric lighting was remodelled, as was the heating system. Roads had to be constructed, and the grounds laid out. In 1919, fresh problems were presented by the demand for a 56-hour week for nurses and maids, and Dr. R. C. Hutchinson presented a supplementary scheme, which involved the (temporary) use of the isolation block as quarters for nurses, and the erection of a day-room. To him also is due the suggestion of a sleeping shelter between wards 2 and 3. By these arrangements the number of beds was increased to 319.

The beds in the new pavilions are either one or two in each room, a sub-division which permits classification into early and more advanced cases and the reception of observation cases.

In my opinion, the most suitable arrangement for any further additions of staff is to build an annexe to the front of the administrative block, adjoining the matron's rooms.

The history of the Institution as a Tuberculosis Sanatorium for a time was a chequered one. The grounds were in confusion during the period of building. The complaints of patients were numerous, some reasonable, some unreasonable. Good nurses were difficult to get during the war. At all times, naturally enough, complaints tend to be excessive and petty. Of recent years, however, the effort to provide patients with occupation, and other factors, has greatly improved the outlook, the improvement being chiefly due to the exertions of Dr. Hutchinson.

It was a disappointment to the Tuberculosis Officer especially, and also to the Corporation, that suitable land could not be acquired near

the sanatorium on which to start a colony in connection with and close to the Institution. Time may remove the obstacles.

So far as Baguley Sanatorium is concerned, the capital expenditure up to date is thus stated by the City Treasurer :—

	£	s.	d.
Outlay out of rates	2,704	14	7
„ „ Government grants	4,647	0	0
„ „ loans	*89,479	12	0
Total outlay to 31st March, 1922...	*£106,831	6	7

* Includes £66,927 8s. 5d. outlay prior to incorporation.

ABERGELE SANATORIUM.

When taken over from the Guardians in 1914, the site covered an area of 273 acres, some of which was let to farmers, about 70 acres being used as a farm by the Institution. The ground is irregular, and in parts steep. Much of the estate is well wooded. Two streams pass through it. To the north lies the town of Abergele and the Irish Sea, and Rhyl lies to the north east.

The house which serves as administrative block and sanatorium accommodated 23 patients—13 male and 10 female—and a staff of 17 persons. It stands on a small plateau, which contains also the engine house, laundry, disinfectory, etc.

In the immediate neighbourhood of the house are day shelters and the night shelters, which, along with a shelter higher up, have sleeping accommodation for 23 patients.

The annual rainfall is comparatively low, assuming that it nearly coincides with that of Rhyl, and the hours of sunshine are comparatively high. Shrubs grow luxuriantly, and there is abundant shelter for patients.

There is now before the Ministry a proposal, with plans and estimates,* to build a children's sanatorium on a plateau south of Plas Uchaf of about 25 acres in extent, provision being made for cases of both surgical and pulmonary tuberculosis.

The proposal to erect a sanatorium for the treatment of children was first mooted, and particulars were collected, in 1914, shortly after the sanatorium was acquired from the Guardians. It has since been considerably altered. The site originally proposed covered 12 acres,

but has been enlarged to 25 acres. The completed proposal has been suspended at present, it is believed, purely on grounds of expense. The City Architect in this proposal has received assistance from Dr. Sutherland, and also from the Ministry of Health, and, of course, the considerations are many of them medical. The School Medical Officer, Dr. Ritchie, has also been consulted.

There is also a proposal before the Ministry to provide a new block for adults, to contain 40 beds and chalets for 20 cases. When these have been provided, the male patients to the number of 13 would be removed from the present administrative building, and would make way for additional staff.

At the transfer of the sanatorium there was also accommodation for 9 cases of surgical tuberculosis in children, which is reserved under agreement for cases sent in by the Guardians, but treated by the Corporation.

Drinking water is supplied from wells, and bath water from the streams, both being pumped up to tanks so as to obtain sufficient fall for purposes of fire extinction. The medical superintendent's house is on high ground above Plas Uchaf.

The subsoil immediately below the surface is limestone on the higher portions of the estate. On the banks of the streams a little way up it is shale, and in the immediate neighbourhood of the streams clay.

On the completion of the new proposals for the treatment of adult cases, the total number of beds for adults would be 93, the original number of 46 being increased by 47. The patients are at present thus distributed; 36 men—23 in night shelters, 13 in the house; 10 women—all in the house. Total, 46.

When the new proposals have been approved there will be: 68 men—40 in the new block, 28 in chalets; 25 women—10 in the present house, 15 in shelters near the house. Total, 93.

Prior to the estate being transferred to the Corporation, the Guardians had made numerous changes in order to fit up the buildings to serve the purposes of a sanatorium.

The Corporation undertook to reimburse the Guardians all expenses to which they had been put, amounting altogether to £24,406 9s. 3d., and the expenditure was thus met:—

	£	s.	d.
From Capital Account	18,313	1	0
„ City Fund Account	2,082	0	3
„ Suspense Account	4,011	7	2
	<hr/>		
	£24,406	9	3
	<hr/>		

The City Treasurer thus states the capital expenditure up to date :—

	£	s.	d.
Outlay out of rates	2,698	3	3
„ „ loans	25,116	16	10

Total outlay to 31st March, 1922 ... £27,815 0 1

The above are the actual possessions of the Corporation for the treatment of disease. In addition to the site at Baguley, the Public Health Committee also owns a site at Newall Green, about a mile from Baguley Sanatorium, with an area of 23 acres 2 roods, which, at a considerable expense, might be utilised either to start a colony in connection with Baguley Sanatorium, or possibly for the erection of a smallpox hospital. The latter would have the advantage that, in the absence of smallpox, it could be worked as an extension for the treatment of cases of tuberculosis.

CLAYTON HOSPITAL.

Clayton Hospital is not the property of the Public Health Committee, and it is impossible to prevent encroachments on the site which will interfere still further with its usefulness. Should the City be visited by smallpox, by taking in the cottages at the Mount it would be possible to treat about 50 cases in the existing buildings. Also, if there were great pressure, additional accommodation could be provided on the site, necessarily of a temporary character.

It would be better not to wait for that eventuality, but to erect a hospital on some suitable site for 100 beds, with room for expansion. If this course is followed, as it should be, a ruling consideration would be the use to which the hospital should be put in the absence of smallpox.

In planning a new hospital, small observation wards should be provided, as well as isolation wards in a separate block.

For the treatment of early cases of pulmonary tuberculosis, the Corporation contract for the use of 62 beds in the Crossley Sanatorium. It is difficult to believe that this arrangement will fall through. At the same time it is possible. In any case, extension of the existing accommodation for early cases of pulmonary tuberculosis is needed.

It was with great reluctance that the Public Health Committee found themselves obliged to forego the inception of a colony in connection with Baguley Sanatorium. Meanwhile, the experience gained at the Barrowmore colony will prove valuable for the future.

In 1894 the Corporation possessed no institution for the reception of infectious disease except the sheds at Clayton Hospital and the wooden pavilions at Monsall Hospital, which, however, they did not administer. No doubt great responsibilities attach to such adminis-

tration, but in no way short of actual possession can freedom of action be secured.

SCARLET FEVER.

Amongst the infectious diseases treated in the fever hospital, scarlet fever takes the first place. Only a comparatively small part of the accommodation has been reserved for other diseases. Yet it is difficult to form a decided judgment as to the influence which hospital isolation has played in the control of that disease.

During the outburst of scarlet fever in the last quarter of 1921, at the close of which I saw a large number of slight cases at their homes, it appeared to me that the cases were altogether of a slighter type than I had been accustomed to see. A large number of them had no eruption at all, and the proportion of very slight cases was high. Yet, when such cases were admitted into the hospital, the medical officers in charge had no doubt that they were cases of scarlet fever. One was, therefore, led to look up the statistics for the last 50 years, when it was seen that an irregular but persistent decline in the death rate from scarlet fever had been going on (see table). In 1871-75 the death rate per 1,000 living was 1.08. In 1917-19 it was about 0.03 per 1,000. The complete figures are as follows:—

DEATH RATES FROM SCARLET FEVER IN SUCCESSIVE
QUINQUENNIA.

Years.	Death Rate.	Years.	Death Rate.
1871-1875.....	1.08	1896-1900.....	0.2
1876-1880.....	1.07	1901-1905.....	0.19
1881-1885.....	0.48	1906-1910.....	0.16
1886-1890.....	0.50	1911-1915.....	0.12
1891-1895.....	0.26	1916-1920.....	0.04

This great decline, however, could not be ascribed entirely to diminution in the number of cases, since during the period 1891 to 1921 case fatality had, with intermissions, declined from 8 to 1.1 per cent.

It is, of course, possible to ascribe these surprising facts to increased diagnostic skill and greater activity in notifying the disease, but this can hardly account for the facts, except very partially.

Moreover, a similar decline in fatality has occurred throughout the country generally.

Although the case fatality was so high in 1891 and for some time afterwards, it would be a mistake to think that a low case fatality had never been experienced prior to that date.

The striking feature in the Manchester figures is the persistent descent of case fatality. The term persistent is used instead of the term steady, because an abrupt fall in the death rate from scarlet fever took place in the years 1881 to 1885, and also in 1890 to 1894.

How much has treatment in hospital had to do with the fall in the death rate throughout England and Wales, and with the fall in case mortality? The question is a complicated and difficult one. There was, undoubtedly, a great increase in hospital accommodation for fever, following the pandemic of smallpox in 1871. The provision then made was primarily and chiefly for smallpox, but the impetus once given to the making of provision for isolation remained when smallpox declined, and the utilisation of the provision then made against smallpox was naturally directed against scarlet fever, at that period the most formidable individual disease. It has been pointed out that the fall in scarlet fever mortality is general, and is not confined to places in which isolation has been provided. The conclusion, however, does not follow. Attention was directed strongly to the disease—always an important fact—and measures were taken to enforce isolation at home where it could not be or was not publicly provided. Every fresh accession to public provision was a fresh witness to the importance of the disease, and a fresh demand for individual care. Yet the history of diphtheria forbids one to think that this alone would have sufficed. Other changes were occurring.

It was not on fever alone that attention was concentrated. A resolute attempt was made to deal with dirt, and with all those accumulations of filth about dwellings which favour the occurrence of sepsis. Did this have a material effect on scarlet fever? Anyone who remembers scarlet fever as it was, and sees it as it is, cannot but recognise that, whatever may be the inwardness of the change, the occurrence of severe septic cases has greatly diminished. Therefore, in that which constitutes the change of type, the severance of sepsis from the other features is a notable fact.

Now two great changes took place in Manchester; the displacement of the midden privies by pail-closets in 1871-80—a change which took place in a comparatively short period—and the subsequent change from pail-closets and midden privies to water-closets, which took place over a much longer period of time, and was accompanied by a vast purification of the subsoil.

There can be no doubt that both these changes meant a great reduction in sepsis, as well as, probably, in the types and significance of sepsis.

All through the earlier reports on the health of Manchester, much attention was given to scarlet fever, and the question was raised whether scarlet fever had any relation to the mode of storage of excreta near houses. It was impossible to give a categorical answer. But the facts collected did seem to imply that the occurrence of scarlet fever stood in a special relation to the proximity of faecal matter to the dwelling. It may quite well be that the relation was rather to severe cases than

to the mere incidence of the disease. But it may also be that there was a more intimate connection. About the year 1880 I had the opportunity of making a close study of scarlet fever, which included examination post mortem of a number of cases. It is well known that in severe cases there is liable to be diarrhoea, and, even apart from this occurrence, the small gut is liable to be much congested, with prominence of Pyer's patches, and enlargement of the mesentine glands. Sometimes these glands were considerably enlarged, comparably, indeed, with what occurs in cases of enteric fever.

It may, therefore, be assumed that in such cases the bowels take a considerable share in the attempt to extrude infective matter. The history of the disease would seem to indicate that this is also the case with the kidneys. Even granting that scarlet fever is chiefly conveyed by direct infection, it seems probable that under unfavourable conditions the excreta play a part in spreading infection.

It would appear that if the events named had had to do with the reduction of scarlet fever in Manchester, the death rate in the years 1916 to 1920 should be relatively small compared with that in England and Wales generally. As a matter of fact, the death rate in those years was .04 per 1,000, as compared with .03 for England and Wales. In 1888 to 1892 the death rate in Manchester was 0.39 as compared with 0.21 for the whole country.

It is not possible to infer that the death rate from scarlet fever has undergone a relative diminution in Manchester, when we take into account factors such as the uncertainty as to the population in the latter period, the change in the birth rate between 1891 and 1921, the alteration in the City boundaries, and the interference of the periodic waves. Indeed, it is remarkable how correspondent have been the relations in death rate in the cases both of enteric and scarlet fever, and, since natural events have specific explanations, we naturally search for a reasonable explanation. It is well known that Sir W. H. Hamer is disposed to connect the prevalence of scarlet fever with that of fleas, and it is possible that this association may throw light on the connection between scarlet fever and excretal impurities of the soil. "Your chamberlie breeds fleas like a loach."—*Henry V.*, Part I, Act 2.

In order to facilitate comparison between the conditions as regards storage and removal of excreta and the death rates from scarlet fever and enteric fever, I give here the recorded facts relating to the alterations in Manchester. But it is necessary to remember that these figures relate to Manchester prior to alteration in 1891, which attained its highest level of population in 1876, when it reached an estimated number 354,432, whereas the death rates shown in Table E of Annual Reports relate to Greater Manchester, a larger area than that for which the

figures are given for 1891 and afterwards, and one nearly coinciding with Manchester as now constituted :—

Year.	Old Closets (middens).	New Pail-closets.	Reduction of Middens.	Death Rates from Scarlet Fever.
1871	58,132	..	18,808	0·71
1872	58,334	..		1·02
1873	57,817	696		1·43
1874	53,667	5,026		1·33
1875	46,216	12,659		0·92
1876	39,324	21,397	38,091	1·23
1877	30,083	31,430		1·05
1878	25,017	36,944		1·07
1879	13,113	44,545		1·07
1880	4,918	59,131		1·03
1881	1,233	63,267	}	0·34
1882	886	65,814		0·81
1883	606	64,333		0·74

The corresponding figures for the replacement of pail-closets and midden privies by water-closets are given in the Annual Report for 1921, but for the sake of completeness are here reproduced (see Enteric Fever Table, following page 40). The figures relating to death rates from infectious disease in that Report are given in Table E, from which the following summary is extracted :—

It is necessary to observe that the above figures relate partly to a city much less extensive than that to which the figures in Table E refer in 1891, and that subsequent figures are changed for purposes of comparison by the inclusion in 1904 of the district of Withington, and in 1909 by the inclusion of Levenshulme and Gorton. In the result, the statistics for Manchester as constituted since 1910 are comparable with those for Greater Manchester (from 1871 to 1891) given in Table E.

The comparison can, therefore, only be general. It is further complicated by the consideration that the diagnosis of enteric fever in the earlier part of the period was far from accurate, nor was that of scarlet fever very reliable.

We note, then, on comparison of Table E and the alterations first from middens to pails, and then from pails to water-closets, that there is not any material change in the death rate from scarlet fever between the years 1871-75 and 1876-80, but that in the next quinquennium the death rate from scarlet fever suddenly drops by one-half. This is the period immediately following the alteration to pails. No further change takes place till the quinquennium 1891-95, when there is again a drop in the death rate by one-half. No change from pails to water-closets had as yet occurred, so that the link appears at this point to be broken. Conversion from pails to water-closets begins in 1891, but the main part of the operation extended from 1903 to 1913, reaching its greatest

intensity in 1908-09. A sudden and sustained drop in the death rate occurs in 1916.

The influence of isolation in hospital was, of course, making itself felt more and more, both prior to and especially after 1891.

We may anticipate remarks on enteric fever by making a similar comparison for that disease. The largest recorded drop in the death rate from enteric fever occurred in the quinquennium 1875-80, and there is no evidence derivable from the figures that conversion from middens to pail-closets exercised any very material effect on enteric fever, though it even is necessary to remember, at this period, the lack of discrimination between enteric and typhus fevers. Nor is there any close relation between conversions to water-closets and the subsequent fall in the death rate from enteric fever, which in the quinquennium 1901-05 was already considerable, at a period when the conversion to water-closets had as yet made little progress. It is true, the subsequent rapid conversion of pails to water-closets is accompanied by an equally rapid fall in enteric fever, to which it no doubt contributed. Assuming, as I think we may, that the conversion from pails to water-closets has affected both diseases, the modes of influence are, no doubt, quite different.

OVERLOOKED CASES.

One of the most potent causes of the spread of scarlet fever is the number of overlooked cases, which, when recognised, are shown in the Annual Reports to produce quite a disproportionate number of new cases. There can be no doubt at all that the actual number of overlooked cases greatly exceeds the ascertained number. It will, therefore, be readily understood that the large number of unrecognised slight cases found towards the end of 1921 indicates that, as regards the spread of the disease, the hospital exercises very little influence, although it may to some extent influence its severity. Indeed, the general movement of this outbreak indicates as much.

RETURN CASES OF SCARLET FEVER.

After the return home of patients who have been treated in the hospital, fresh cases arise in the household at various intervals of time, but all at considerable intervals in weeks after the eruption occurred in the case discharged from hospital.

In my judgment, these cases are due to the influence of the hospital, mainly, if not entirely. As one formerly imagined this influence, it consisted in the storing up in the nostrils, during the act of breathing, of a mixed infection derived from other cases. At various periods after return these are extruded—in sneezing, during exercise, in play, and so forth—and take effect chiefly during close contact of the infecting and the infected person.

After the end of the six weeks' supposed quarantine at home, very few cases occur in the household, though it is then that return cases begin, at a period, that is, when the influence, direct or indirect, of the home case has nearly died out.

The course of infection in the cases treated at home is very similar to that pursued in households in which a case has been overlooked, and there is no evidence that subsequent cases which occur after an interval of six weeks after the first case are due to direct infection from that case. Indeed, the probability is against it.

Where the infecting case has been discharged from hospital it is very different. Here, with exceptions, the subsequent cases are due to the cases discharged, as their distribution in point of time proves.

They occur at periods when such evidence as we possess goes to show that the case treated at home has ceased to be infective, unless we assume that all the susceptible material has been consumed, where cases have been treated at home. This does not appear to accord with the facts. I admit that this is not conclusive, but it creates a presumption.

With regard to the distribution of return cases, figures given in the Annual Report for 1907 show that the number of return cases is greatest during the first fortnight, then gradually diminishing during a period of two months, after discharge, though no absolute limit can be fixed.

The amount of discussion on this subject has been so great that only a few observations can be offered, and many points must be omitted in order to shorten this statement. Before proceeding, however, I must mention one point. It is rarely possible of any single case to say that infection was derived from a discharged case, and not from some other source.

Isolation in hospital removes a certain amount of infection from the households protected, and there is on the whole a balance of infection in favour of the hospital, but it is not a large one.

The amount of infection due to cases retained at home, taking into account the susceptible material remaining, is greater than in households from which cases are at once removed, and a balance must be struck between this gain and the loss sustained from the occurrence of return cases.

In my Annual Report for 1895 I gave it as my opinion that these cases were largely due to the storage in the nostrils of infection collected from other cases in the hospital, and were little, if at all, influenced by the presence of nasal discharge or otorrhœa.

A plan of operations was devised, and carried into effect for a time under my immediate supervision, apparently with success, though it must be admitted that the experiment was carried out under favourable conditions as regards numbers in Hospital.

When the numbers increased, this experiment was not properly carried out, and the numbers of return cases rose again. The experiment consisted in separating the convalescent non-septic cases in a wooden pavilion, under the charge of a sister who was responsible for seeing that the nostrils and throats were cleansed with a weak solution of permanganate of potash, and that the patients were induced to take active exercise outside, so as to continue the oxidation of the mucous membrane. The body was oiled so as to limit the infective matter in the ward.

The cases were, of course, also regularly bathed.

The principle of the treatment, however, was that of oxidation of the mucous membrane.

Septic cases would have spoiled the ward, and required other treatment. They were afterwards admitted. But such admission defeats the measure as one of defence.

When in charge of the Westhulme hospital in Oldham, I had observed that after a scarlet fever ward had been occupied for some time, septic troubles increased, and that they were diminished when new patients were introduced into an unused ward.

It is, of course, matter of common experience that the discharged patients cause return cases in an increased degree when pressure on hospital space sets in with increasing number of cases. This can scarcely be due to increase in personal infectivity, but is best explained by accumulated infection, though we have no conclusive means for determining whether persistent infection is of internal or extraneous origin.

Dr. Duncan Forbes, in two admirable papers in the Annual Reports for 1903 and 1904, discusses this subject. In the Report for 1903 he takes this view of the infectivity of discharged cases, as contrasted with continued infectivity. But, in any case, as he remarks, treatment is the same. In the Report for 1904, page 64, are given facts which tend to support this view.

But, in fact, the figures given relating to the occurrences following cases treated at home, and those following cases returned from hospital, represent two different kinds of events.

A table given by Dr. Forbes in the Annual Report for 1905, page 28, with the figures at the top of page 29, quite disperses the fable as to return cases depending on the primary case having discharges or other complications.

Dr. M. B. Arnold takes a different view in his paper given to the Epidemiological Society on March 22nd, 1912, Vol. V., No. 6.

At the conclusion of his excellent paper, he stated: "Allowing that certain lines of treatment in hospital may diminish the number of cases, this is only equivalent to saying that the percentage of cases discharged whilst in a condition of protracted infection has been reduced." True, but as regards the cause of the infectivity this settles nothing. Also it must be admitted that continued infectivity would be less easily removed than accumulated foreign matter.

Dr. W. St. C. McClure, in a paper on Public Health, June, 1914, gives a clear review of the position, and vindicates the value of the isolation hospital.

By attention to the cases in hospital, Dr. Forbes and Dr. Arnold were again able to improve the return case rate.

It appears to me that so long as scarlet fever continues to be isolated, if it is once recognised that by suitable measures return cases can be much reduced, special attention should be given to the measures required and to the administration provided to ensure such reduction. In addition to the measures pursued in hospital, the following steps should, I think, be taken. No greater number should be admitted than will admit of the separation of cases one from another, and their division into three groups—acute cases, septic convalescents, and non-septic convalescents.

As a rule, wherever possible, slight cases should be nursed at home.

The admission of cases should be controlled by the Medical Officer of Health, or his responsible assistants, after consideration of the facts. Cases should be admitted, *as a matter of course*, only from institutions, from places where food liable to contamination is sold, or from homes in which effectual isolation is impracticable. The question of providing open-air sleeping shelters or verandahs for septic cases should be revived.

The following points about "return" cases are perhaps worthy of mention. Infection from discharged cases appears to require closer contact than from primary cases. Hence, when cases of scarlet fever are discharged from hospital, parents receive a printed warning to keep

the discharged case as far apart from other members of the family as possible for some weeks. Experience shows that this advice is easier to give than to follow. The ages of return cases are, on the average, lower than those of ordinary primary cases. The case mortality is, therefore, higher.

SURGICAL CLEANLINESS.

It is of vital moment to keep all parts of a scarlet fever ward surgically clean. The medical superintendent should carefully inspect the closets, lavatories, etc., as part of his round. No fluff or dust should be allowed to rest on any part of the floor or behind any pipes. Here, perhaps more than anywhere else, is scrupulous cleanliness required. It follows that in scarlet fever wards defective floors should not be allowed to continue, and that any defects in the skirting boards or other parts of the surfaces should be at once remedied.

THE FUNCTION OF THE HOSPITAL.

It will be seen from the above observations, and from the figures for the number of notifications in successive years, that it would be hopeless to expect that the hospital will materially affect the number of cases occurring in any periodic wave. But it would not be so easy as it looks to change the uses of wards now devoted to scarlet fever.

Nor is this conservatism based entirely on fancy. The disease is, it is true, infectious chiefly in the weeks immediately following an attack. But, rightly or wrongly, it is believed to remain infectious for at least six weeks in a certain number of cases. Hence, an attack entails serious inconvenience to a household, and where great strictness is observed with respect to the occupation followed by contacts, it may cause great hardship. It is thus necessary, if the patient is not removed to hospital, to make and enforce special rules in respect of workers. Then, again, if, in a crowded household, the first case is not removed, succeeding cases are liable to take on a more serious form. This is a well-known tendency of infectious diseases. Here, then, we come upon one of the values of isolation in hospital. In such cases, prompt removal to hospital makes an impression on the type of the disease. The same is also true of serious and septic cases. When the hospital is able to cope with the demand for isolation, it is all the time modifying the type of the disease in one direction.

It follows that the greatest amount of influence is exerted on type during the ebb of the periodic wave, so that, in all probability, an increased effect on type is effected every seven years or so. It is at that period that the greatest influence can be exerted by isolation, by resolute effort to reduce the number of return cases, and also to reduce sepsis.

Such variations of type spread from one locality to another, and it is manifest that scarlet fever is a disease which is susceptible of them.

It would therefore be unwise to assume that the changed character of scarlet fever in all parts of the country has not been caused by hospital isolation.

Probably there have been three main factors: The effect of hospital isolation, the enforcement of isolation at home, and the reforms which have been effected in dealing with excreta. No one doubts that the latter has been a powerful factor in reducing the incidence and mortality from enteric fever. Yet the mortality from scarlet fever, though not the incidence, has declined in a similar manner.

There is only a limited amount of accommodation for fever of any sort. Should this be reserved, as now, mainly for scarlet fever, or should it be at the service of other fevers?

It would, I think, be unwise to relinquish the assistance which the hospital affords in keeping scarlet fever down, unless for some important and temporary object.

Thus, if an epidemic of plague or cholera or pneumonia were to supervene, or even if we were threatened by a serious and overwhelming outbreak of smallpox, I, personally, should not hesitate, should the necessity arise, to retain at home all cases of scarlet and other fevers, and to treat, under suitable precautions against the spread of infection, any of these diseases.

But I should not lose the grasp which we have obtained upon scarlet fever for any inadequate cause.

It was manifest towards the end of 1921, and in the spring of this year, that we were not retaining that grasp, and that we could only do so by exercising a strong medical selective control over admissions to the hospital.

In such an emergency we must rely for enquiry and administrative efficiency on the Public Health Staff, and I am of opinion that this should be strengthened and utilised to the full in determining the procedures to be adopted in the household.

The best mode of dealing with such epidemics as the scarlet fever outbreak, and the measles outbreak which we are now passing through,

can only be settled by personal observation and watchfulness on the part of the medical officers.

THE TYPE OF SCARLET FEVER.

We have seen that the type of scarlet fever has undergone a change in one direction for at least 30 years. What do we mean by type and epidemic constitution? We are really only expressing that the milder and more obscure forms of the disease have become relatively more frequent; at all events in this instance. It more is intended than that it needs stating explicitly.

During the epidemics of influenza a vast amount of bacteriological investigation went on. Coupled with the epidemiological observations it appeared to show that there was a fundamental infection which drew along with it at least several other micro-organisms, such as the pneumococcus, streptococcus haemolyticus, streptococcus viridis, and others. These, surely, had relation to the different epidemic types in the three outbreaks. Did their presence constitute the change of type, and how did they come into the scene? In the same way in scarlet fever the fundamental infection appears to be present, uncomplicated in most cases; chiefly the comparative rarity of streptococcal infection appears to constitute the difference. What has caused its dissociation? How far can that be relied upon? Is it possible to deal with dangerous forms of scarlet fever as, for practical purposes, conditioned by the adjuvant micro-organisms, to be prevented through them or cured through them. The same question applies also to measles.

In the Annual Report for 1921 I mentioned the remarkably close association between influenza and scarlet fever, and surmised that one disease might be conveyed or reinforced by the other, especially towards the end of that year. It may be asked, can change of type be dissociated into its elements, and these elements pursued until they yield up the secrets of prevention and cure which they must contain?

The words "type" and "epidemic constitution" by themselves help nothing, unless their inner meanings are laid bare.

Meanwhile, this disease having altered to the extent which it has now done, it seems permissible to experiment with it cautiously and watchfully on clear principles, but not without replacing any constriction in the use of hospital isolation by a corresponding increase in enquiry and activity on the part of the Medical Public Health Staff.

Such are the matters connected with scarlet fever which seem to have the most important bearing on public health as distinguished from

clinical administration. But there are others which it may be worth while to mention.

It is well known that outbreaks of scarlet fever are liable to occur from contamination of the milk supply. Fortunately these are usually, clinically, of a mild character. One such outbreak in the Cheetham Hill district was skilfully investigated and reported on by Dr. J. R. Hutchinson. With him was associated Lieut.-Col. J. W. Brittlebank, as the view has never been disproved that such outbreaks may arise from disease in the cow, although no evidence in support of it has been obtained here.

The tendency of these outbreaks is undoubtedly to mitigate the type of scarlet fever generally, though they are troublesome at the time.

A very singular and extensive outbreak of sore throat, accompanied by considerable pain in the throat, in Fallowfield, was investigated by myself, also with Col. Brittlebank's assistance. There could be no doubt that this was due to milk. Occasional rare cases had eruptions vaguely resembling those in scarlet fever, but it was quite clear that they were not scarlatinal. This outbreak is interesting, as the farmeress was allowed to sell her milk, after sterilisation, on condition that her customers were informed—a condition which was enforced. The outbreak rapidly disappeared.

One of the most excellent investigations on scarlet fever from the Manchester Public Health Office was one carried out by the late Dr. B. K. Goldsmith into the latent period of scarlet fever, and into the influence of schools in causing the spread of scarlet fever. The investigation was a statistical one. But it may be mentioned that over a long series of years the incidence of scarlet fever, week by week, has been recorded for individual cases, distinguishing age and sex. These records are available.

Dr. B. K. Goldsmith was a man of great ability and most attractive character, who went to Bombay as Assistant Medical Officer of Health, and distinguished himself in that position. His ship was torpedoed coming home, and his health was undermined by his subsequent experiences. I consider that he was a great loss to the Public Health Service.

The title of the admirable paper embodying the above enquiry is, "The Influence of School Life on the spread of Scarlet Fever," by B. K. Goldsmith, M.B., Ch.B.(Edin.), D.Ph., *Lancet*, 1907, Part I, p. 1765.

A striking characteristic of scarlet fever, once it has entered an institution for children, is its tendency to crop up from time to time afterwards after an apparent lull, often in very slight and anomalous forms. As the result of personal investigation, I have no doubt that it is handed on from person to person in forms altogether too slight to

attract attention unless hunted for. It may be that the infection also attaches itself to the clothing of the inmates, or to the dust of the establishment. The experience of such institutions emphasises strongly the view that it is by adequate public health investigation only that these slight forms of scarlet fever can be controlled. They are very difficult to distinguish from slight forms of sepsis.

ENTERIC FEVER.

The great reduction in the incidence and mortality of enteric fever is one of the signal triumphs of the Public Health Service. This disease attacks men in higher degree than women, and is most prevalent at the ages 15 to 24, and 25 to 34, so that it is, like phthisis, a malady which is economically of great importance.

In 1891, when the City was extended, typhoid fever had not been very long differentiated from typhus, and, apart from this circumstance, it is a disease which takes many shapes, and is liable to be confounded with not a few other ailments. For example, it has frequently been confounded with acute bronchitis, pneumonia, influenza, acute tuberculosis, appendicitis, and so forth. Indeed, it not rarely begins as an attack of pneumonia, and it is not always easy to distinguish from an attack of disseminated tuberculosis. Any conclusions drawn from the statistics before 1896, when a new means of diagnosis came into general use, cannot therefore be regarded as reliable.

Still, the general clinical features were well known, as well as many of the causes concerned in its spread, and in 1895 I gave an address to the Sanitary Inspectors on the matters which they should look into in investigating cases with a view to further action. The matters requiring attention are so many, and require so much pains to make the information in regard to them reliable, that too much cannot be expected from the average inspector of nuisances. I have urged in report after report that a special inspector, with acumen in enquiring into cases, should be appointed, whose first duty it would be to make a painstaking and accurate enquiry into each case. This is the more necessary now that the disease has declined so much. Our aim should be its extinction.

In order to understand the position as regards enteric fever, certain tables are necessary. Table 1 shows side by side for each year, and at quinquennial groups of years since 1891, the number of notifications, the death rates, and the number of deaths for every 100 cases accepted; also the number of conversions of middens and pail-closets to water-closets year by year, the percentage of cases traced to direct infection, the percentage found to have occurred in association with the previous consumption of shellfish, and the total percentage in these two groups.

Table 2 is found amongst the usual tables for enteric fever in the Annual Reports of the Medical Officer of Health, and shows the numbers notified at groups of ages since 1891, and the percentage dying at each age group. The case mortality, as it is called, is highest in infancy, and declines up to the age of 8, after which it ascends, and then more rapidly as age advances.

Table 3 gives the distribution of cases according to the following groups: males above 14, occupied females above 14, women at home, and children up to the age of 14. This shows that the incidence is highest on group 1, next on group 2, next on group 3, and lowest on group 4.

Table 4 shows the incidence in a typical year, viz., 1911, week by week.

TABLE 1.—TABLE OF FACTS RELATING TO ENTERIC FEVER.

Year.	No. of cases notified and accepted.	Annual death rate.	Percentage of deaths to cases.	Conversions of pails and middens to W.C.'s.	Percentage of cases traced to direct infection.	Percentage of cases found in association with consumption of shellfish in such manner as to suggest causation.	Percentage of cases traced to some source of infection.
1891....	761	0.37	..	55	..	..	..
1892....	610	0.24	..	198	..	..	..
1893....	618	0.25	..	279	..	..	..
1894....	460	0.17	19.6	268	..	..	..
1895....	493	0.18	18.9	304	5.07	..	5.07
1896....	513	0.22	24.2	481	14.62	3.90	18.52
1897....	503	0.21	17.9	584	14.91	2.98	17.89
1898....	642	0.22	18.8	1,096	15.89	5.14	21.03
1899....	381	0.13	18.1	1,146	19.42	9.97	29.39
1900....	378	0.14	18.0	1,507	16.40	2.65	20.11
						(milk 1.06)	
1901....	359	0.14	19.8	1,384	14.20	7.24	21.45
1902....	378	0.12	16.9	2,258	15.87	13.49	29.36
1903....	387	0.17	23.8	3,278	21.19	10.85	32.04
1904....	325	0.12	18.8	3,913	26.15	14.15	40.30
1905....	345	0.09	15.9	5,897	44.50	32.5	77.0
1906....	384	0.14	21.4	7,408	36.6	30.8	67.4
1907....	265	0.06	13.6	2,214	17.36	25.28	42.6
1908....	393	0.11	20.1	12,925	24.68	21.89	46.57
1909....	369	0.15	19.2	12,674	20.32	13.55	34.0
1910....	358	0.09	19.0	9,756	17.32	19.83 (ice-cream 16.48)	53.6
1911....	256	0.07	18.8	10,150	17.1	16.3	33.4
1912....	242	0.06	17.8	4,747	24.38	48.34	72.7
1913....	292	0.06	16.1	1,498	..	31.85	31.9
1914....	156	0.05	21.8	489	..	16.09	22.5
						(milk 6.41)	
1915....	174	0.06	26.0	169	11.5 (military 17.3)	12.6	31.4
1916....	78	0.03	28.2	35	14.1	21.8	35.9
1917....	86	0.01	11.6	3	..	..	..
1918....	68	0.01	14.7	89	16.2	11.6	27.8
					(serum contacts)		
1919....	90	0.02	18.9	1	16.7	4.4	21.1
1920....	54	0.02	24.07	2	25.8	16.7	42.5
1921....	74	0.02	19.6	14	23.2	23.2	46.4
				84,808			

The death rates given in Table 1 may conveniently be summarised as follows :—

Years.	Death Rates per 1,000 Living.	Pails converted.	Middens converted.	Pails and Middens converted.
1891-95.....	0.24	616	488	1,104
1896-1900...	0.18	941	3,873	4,814
1901-05.....	0.13	8,774	7,951	16,730
1906-10.....	0.10	34,971	10,006	44,977
1911-15.....	0.05	13,187	3,866	17,053
1916-20.....	0.02	111	19	130

TABLE 3.

From the census returns, 1901, we get the following numbers of persons living in Manchester at the census :—

	Group 1. Males age 14 and upwards.	Group 2. Occupied females 14 and upwards.	Total Groups 1 and 2.	Group 3. Unoccupied females age 14 and upwards.	Group 4. Children under 14 years of age.	Total Groups 3 and 4.
	181,172	86,978	268,150	110,878	164,844	275,722
Cases of enteric (1904)	141	47	..	54	131	..
Cases in each group per 10,000 persons..	7.8	5.4	..	4.9	4.8	..
Percentage of cases in groups 1 and 2, and 3 and 4 (1900-04)...	..	..	58.93	..	..	41.07

We see, then, that the proportion of cases is highest among male workers, then among female workers, and is about equal amongst women and children, notwithstanding their proximity to pail-closets and middens over a longer period than workers, and notwithstanding their having more to do with closets and being more exposed to contamination of food by them. On the other hand, workers, both male and female, have greater opportunities of consuming shellfish.

Notwithstanding the defective character of the earlier diagnosis of enteric fever, and consequently of the facts of notification, it is desirable to study the recorded particulars.

It is a well-known fact that enteric fever is, on the average, more severe in midden than in water-closet towns. Scurfield gave the ratio of the death rate as 2 to 1. If we study the above table along with a table of conversions to water-closets, it will be found that the incidence and death rates from enteric fever generally follow a descending course corresponding with the number of pail-closets and middens, and no doubt some descent was produced in the disease by conversions to water-closets.

But the descent in enteric fever preceded the commencement of this conversion, though it followed the conversion of middens to pail-closets. The figures before 1891, given by Dr. Tatham, which relate to an area corresponding to the Greater Manchester of to-day, are near enough for our purpose. From these we see that, though the conversion from middens to pails took place in 1871-80, no material change took place in the death rate from enteric fever in 1881-90.

The conversions are shown as follows:—

NEW PAIL-CLOSETS.

1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
696	5,026	12,659	21,397	31,430	36,944	44,545	59,131	63,267

The death rate from enteric fever is given by Tatham for Greater Manchester as:—

Years.	Enteric Fever.	Typhus Fever.	Continued Fever.
1871-75	0.43	0.14	0.21
1876-80	0.29	0.08	0.11
1881-85	0.20	0.05	0.03
1886-90	0.30	0.02	0.01

Hence, though a great drop in the death rate from fever took place between 1871-75 and 1876-80, it largely preceded, and did not follow, conversion from middens to pails. If the fall in the next quinquennium was due in some measure to conversions to pails, as it may have been, it was followed in 1886-90 by a rise. Hence, it may be surmised that the change from middens to pails was not alone adequate to produce a steady fall in enteric fever. In 1891-95, however, a fall occurred in the death rate which was destined to be continued.

Now if reference is made to Table 1 above, it will be seen that this big fall in the death rate preceded conversions to water-closets, as did

also another great fall in 1896 to 1900. A third marked fall occurred in 1901-05, before nearly one-third of the conversions had been carried out. In 1906-10, during which period considerably more than half the conversions occurred, the drop in the death rate is least of all.

Thus, although the reduction in pail-closets year by year accompanied the fall in the death rate, any correlation founded on that coincidence cannot be taken as showing that the fall in the death rate was due to conversions. It is, in fact, largely coincidence, notwithstanding the well-founded knowledge that conversion from pail-closets to water-closets is calculated to lead to a reduction in the incidence and death rate from enteric fever.

But an important change occurred in 1894, which was calculated to alter the relation of enteric fever to pail-closets. Arrangements were then made whereby, in the case of pail-closets, whenever a case of enteric fever was notified, a pail with lid, charged with a disinfectant, should be provided for the enteric fever excreta. This was calculated to no small extent to neutralise the effect of pail-closets in propagating enteric fever. Moreover, though no record has been made of this, either then or soon after, arrangements were made for scattering quicklime over the middens when they were emptied—a much less effective procedure.

Another factor came into operation in 1897. It has been already mentioned that prior to this period there was great lack of accurate diagnosis of enteric fever, many being notified which were found in hospital not to be cases of that disease. The effect of this was to raise the death rate from enteric fever in the earlier periods.

In the beginning of 1897 Widal's blood-serum test, as applied by Delépine, was placed at the disposal of practitioners, and was at once used in nearly all cases. In that way many cases were excluded which were not enteric fever, and opportunity was given for a more accurate study of the disease.

The number of cases notified year by year has already been shown in Table I. A marked fall in the number of notifications occurs from 1894-99, which, to some extent, has been accounted for, and is not due to conversions. In 1898 there is a reversion to the numbers notified in 1891-93. On examination of the figures week by week, the increase is seen to have been in the last two quarters, and to have been determined partly by a hot summer. The figures in October strongly suggest the influence of shellfish. A fall in the numbers notified occurs in 1899, but the figure then reached remains fairly constant up to 1911, when another marked fall occurs.

More than half the total number of conversions occurs in the years 1908-11. The number of cases is then stationary till 1914, when a

further drop takes place. Meanwhile, conversions were rapidly proceeding. It is somewhat doubtful how much of the drop in 1911 was due to the conversion of closets, and how much to the action of the Markets Committee in connection with shellfish.

All possible conversions were nearly over in 1914, yet the number of notifications continues to fall rapidly in 1914 and onwards, and in 1920 is less than one-tenth of those in 1891-93. This, I believe, to have been largely due to a suppression in 1913 of the most dangerous source of mussels coming in. But another important factor is the removal of the mussel-eating part of the population, and their protection against enteric fever by inoculation.

In 1895 and onwards it was not possible to determine the influence of middens and pails, but it was possible to determine their relative effects. This was done year by year, when it became evident that cases occurred relatively in higher proportion in association with middens and pail-closets than with water-closets. The facts are set forth in successive reports.

The relation between middens and pails was a peculiar one. Generally, in autumn, cases occurred in relatively high proportion in association with middens. At other seasons the relation appeared to be reversed. For the manner in which this was worked out, I must refer to my earlier reports, as it would take up too much space to set it forth fully.

It was not possible at first to explain this difference, as it was not till 1903 that the action of flies was fully recognised, which leads one to observe that it could only be a relative effect, as the pupæ of flies were found, often abundantly, in connection with pail-closets. Still, middens were more suitable for the breeding of flies, and no doubt that is why they are more prominent in autumn. It is proper to observe that the pupæ found in connection with pails were largely those of *homalomzia*, which has an earlier season than *musca*.

In the earlier years, my enquiries into the etiology of enteric fever centred chiefly round four points: the supposed influence of fouled soil, the action of midden and pail-closets, the action of shellfish, and the extent of direct infection. The influence of soil had been a matter of speculation in Oldham, though actual observations and experiments were carried out at St. Helens by Dr. John Robertson, Medical Officer of Health for Birmingham, who found that, under special favourable conditions approaching artificial culture, enteric bacilli planted in the ground could be demonstrated on the surface a year after.

In the year 1897 Professor Delépine demonstrated at Eccles the presence of typhoid bacilli in the walls of an infected midden which had been disused for 13 months.

Subsequent observations by Horrocks and Firth seemed to make it certain that, in natural soils, infection does not last for prolonged periods such as these, and that enteric bacilli do not multiply in the soil. But they still leave it open to suppose that within a short period infective matter may reach the surface and be dispersed.

The influence of middens and pails must, therefore, in all probability be in general a surface one. But where there has been much deposit of infected excreta, dust may well produce a measure of subsequent infection.

At the same time, the idea that enteric fever is reinforced in autumn by bacilli grown in the soil must be abandoned.

In 1898 a series of tables is given from which is deduced the theorem that a critical rise in the number of cases commencing in one week suddenly occurs in a certain week in July, August, or September—what was called the “critical rise”—and that this was in relation with a previous period of rainfall preceded and followed by warm and dry weather. This idea is pursued year by year, but no explanation was arrived at, though the facts were seen to have relation to the behaviour of diarrhoea. It was not till 1903 that they were seen to find their natural explanation in the influence of atmospheric conditions in the production of flies—the carriers of infection. Although the main, this may not be the sole, explanation.

Similarly, although the main, it may not be nearly the whole explanation of the effect produced by the presence of middens and pail-closets, which afford independent opportunities of contracting the disease, especially in windy and dry weather. Their mere presence near a house must be regarded as dangerous, even if there were no flies.

This was illustrated in 1898, notwithstanding the provision of special receptacles for enteric excreta, and notwithstanding disinfection. But all such precautions are precarious unless they are very stringently looked after.

In the year 1895, attention was first directed to shellfish as a possible source of cases, and a list is given of cases standing in relation with the previous consumption of shellfish in the year 1897, and in subsequent years. These are put together in my evidence before the Commission on sewage disposal in 1904. The facts collected, however, are those obtained by the Sanitary Inspectors in general, and are probably very deficient regarded as a complete statement of the connection actually existing. But they suffice to draw attention to the possibility that infection by shellfish, and especially by mussels, is not an infrequent occurrence.

It is difficult to adduce evidence that a particular case has been infected by mussels. In any given case the person concerned must have

consumed shellfish at a reasonable period before the commencement of an attack, and the period originally selected was a week to 21 days.

This period is unduly restrictive, perhaps. Not a few cases are taken ill at once with symptoms of acute enteritis, enteric fever developing as well at a future date. Also, cases of enteric fever often begin before their ascertained history indicates a beginning. Probably one day to 28 days would better represent the facts, especially as a shellfish eater generally consumes shellfish at other times than the one ascertained.

The case suspected, on careful investigation, must be shown to have been subjected to no other ascertainable source of infection.

This, again, is no proof in any particular case. But it is a singular fact that cases brought into relation with the previous consumption of shellfish are, with few exceptions, not traceable to any other source of infection. Thus, in 1904 and 1912, out of a large number of cases brought into relation with the consumption of shellfish, not one could be traced to any other source. In 1912, 48.4 per cent of all cases of enteric were thus brought into relation with shellfish. In the aggregate, this constitutes very strong proof that shellfish are, and from the first have been, largely responsible for causing enteric fever.

Occasionally it was found that two companions eating raw mussels together both contracted enteric fever, and this added much to the evidence that each of them had in this manner contracted the disease. In 1908, Dr. J. R. Hutchinson obtained three cases who were thus affected. Incidentally, such occurrences strengthened the case for single infections. More frequently of two companions eating of the same group of mussels together, one got enteric and the other got an immediate attack of vomiting and diarrhoea.

In 1901, the first of the years of more intense investigation began. By this time it had become evident that in the uncertainty attaching to the causes of enteric fever, the questions as to causation could only be settled by a more detailed investigation of each case. We had found in Inspector Hewitt, who has been since attached to the Tuberculosis Office, a man with a genius for investigation. I therefore utilised his services, under personal supervision, for the new enquiries instituted. Unfortunately, it was not possible to send him to every case, but, as it was, his investigations put an entirely different aspect on the causation of enteric fever.

It became quite evident that with sufficient energy of investigation, the majority of cases could be traced either to direct infection or to the consumption of shellfish. In 1905, 99 cases were so traced. New facts emerged, or appeared more strongly than before, to point to shellfish as a decided source of infection. Occasionally, and at different periods of the year, cases would make their appearance in particular districts

in little groups, traceable to the mussels sold by one dealer. When the cases were traced back to particular merchants, it became evident that these cases occurred in the supplies from a few out of a number of merchants. Occasionally also, the layings or localities from which the mussels were derived were ascertained by the assistance of the merchants. Certain layings then stood out as especially implicated, and one in particular appeared to exert a far greater influence than the others, viz., Conway.

Thus, in the fourth quarter of 1907, 14 were traced to Conway, as compared with 7 from other layings. In 1908, Dr. J. R. Hutchinson says that, out of 15 cases giving multiple histories, in only one is it certain that Conway mussels were not implicated. In 1912, Dr. Barbara Cunningham states that three dealers are responsible for 69 out of 108 cases, though it is impossible to give the layings as the dealers will not give the information.

Suspected mussels were submitted to Professor Delépine at various times, and proved to be grossly contaminated. Professor Delépine also submitted a report to the Markets Committee with the contents of which I was not acquainted, as I was not acquainted with other bacteriological investigations made for them. I must acknowledge, however, receiving from Mr. Holborn, a former Chief Inspector of the Markets Committee, much useful information for the Sewage Commission Report in 1904.

It is there recorded that an investigation was made at 1,354 houses occupied mainly by people of the artisan class. Of these, shellfish (mostly oysters and mussels), were partaken of at some period of the year 1902 in 384 instances. They were used raw at 90 houses, cooked at 360 (The apparent discrepancy in the numbers is due to the fact that at some houses they were used both raw and cooked).

Now the incidence of mussel enteric cases is classified in various annual reports, according as the mussels were raw or cooked, and the proportion is, roughly, the reverse of the above. Allowing that cooking does not always kill the bacillus, this must be regarded as creating a strong presumption that raw shellfish are liable to produce enteric fever.

Why do so few cases arise where the consumption is so great? It may be assumed that the mussel speedily rids itself of isolated bacilli, but that particular mussels get more contaminated when they take in shreds of mucus affected with bacilli.

Representations were frequently made to the Markets Committee from an early period, and in 1908 Dr. Hutchinson states that they were taking steps to ensure purity in the mussels.

Dr. McClure, in the Annual Report for 1920, states that with the co-operation of the merchants in 1912, 1913 and 1914, supplies were

completely stopped for a time from four layings at different parts of the coast. Although no details were, at the time, obtained by me, I am informed that the Markets Committee did actively endeavour for a number of years to limit or even stop the introduction of polluted mussels. In this they acted in association with the Fishmongers' Company. Nor were the Sea Fisheries Committees altogether idle.

The Chief Inspector of the Markets Committee on various occasions stopped polluted supplies of mussels, from his knowledge of mussels, and with the assistance of investigations by the Fishmongers' Company, not by means of any legal powers, but through his influence with the dealers. From 1913-16, Conway mussels are stated to have been definitely stopped, during which time a purification tank was provided. It is well-known that when put into pure sea water mussels clear themselves of enteric infection very quickly, say in a fortnight, and this provision will probably suffice if it is kept up and watched. This measure should be insisted upon over all layings, by the provision of purification beds or otherwise. Unfortunately, it cannot be insisted upon on the Irish coast.

It is to these measures, I do not doubt, that we owe much of the reduction in enteric fever from 1914 onwards, possibly also in 1911 and 1912.

It will be observed that, in bringing it about, the Markets Committee and their inspector started from the polluted mussel inspected shortly after arrival. I am informed that such polluted mussels are not difficult to recognise, and that in any case the diagnosis is easily confirmed by investigations such as those carried out by the Fishmongers' Company.

This surely is the easiest and best way to proceed. I have no reason to doubt that, if it were considered a legal course to take, the same procedure would continue to be adopted.

But when the Shellfish Regulations were promulgated, the Medical Officer of Health was made the starting point. He was to find evidence of infection and discover the offending laying. In the first place such evidence cannot often be discovered in a convincing form, and when it is, it is difficult to discover the laying from which mussels consumed at some previous period have come. In 1916, I attempted to get the Markets Committee to discover the layings for me, but was told that they could not do so and that it was my concern. And so, of course, it was. But that only emphasises the fact that the inspection of foods, and more particularly the inspection of shellfish, should be placed directly under the Medical Officer of Health, as the Public Health Act, 1875, requires. I was informed that the shellfish merchants do not know from what layings a given supply of mussels have come a fortnight back, which makes it the more remarkable that we used to get the information in many cases.

I am given to understand that the control of mussels is much more difficult since the 1915 regulations were promulgated, as the merchants now consider that they need not take any action in respect of mussels, unless infection is declared, and only in so far as the representations of the Medical Officer of Health are acted upon. They consider, I am told, that their trade was injured by the stoppage of particular layings.

I am of opinion that every merchant dealing in shellfish, whether selling or buying, should be compelled to keep a register of the amount so sold or purchased, of the dates of sale and transfer, and of the layings from which the shellfish were derived, with such other facts as may prove to be necessary.

Every merchant or purveyor of shellfish should also be obliged to enter in another register any sale to a shopkeeper, whether on a large or small scale, or to any hawker, giving name and address of the vendor, the shellfish sold, the date of sale, the quantity sold, and the laying whence derived, a copy of this information to be furnished to the shopkeeper or hawker concerned, who should be required to produce the information to an authorised officer of the Corporation.

But in addition, the authorised inspector of the Corporation should be at liberty to examine and take samples of mussels, and if, on his certificate and on bacteriological examination, a batch of mussels is declared to be contaminated, the authority should be empowered to stop the supply until it has been proved that the mussels have been freed from contamination.

Every hawker should be obliged to have his name and address placed on his cart or other means of conveyance in legible and conspicuous characters, so that he may be identified in connection with any particular sale, and the same should apply to any stall or other place of sale.

But it is to the authorities responsible for the condition of the layings that we should look for the chief measures of protection, and they should be obliged to see that all shellfish, before being sent to the market, are in a clean condition, and are not subsequently stored, whether temporarily or permanently, in such a manner as to expose them to contamination. It is not alone enteric fever which is concerned, but other forms of enteritis are also communicable.

It is a question whether the value of shellfish warrants their continuance as a form of food. If it does, all concerned should be obliged to see that an uncontaminated article is placed on the market.

There is another feature of mussel infection of considerable importance. For a considerable time one had had the suspicion that cases found in connection with mussels were unusually severe, and cases given by Dr. J. R. Hutchinson in 1908 indicated that such is the case. Dr.

Cunningham in 1912 furnishes figures which also appear to show that such is the case, though they are not conclusive. It should be possible, however, to establish the facts. It is an important question to clear up, since, if it is so, years with a high percentage of fatal enteric cases may be suspected to be years in which mussel infection has been exceptionally prevalent. Thus, for example, if this opinion is valid, the case mortality in 1916 being 28.2 per cent; in 1917, 11.63 per cent; in 1918, 14.7 per cent; in 1919, 18.9 per cent; in 1920, 19.6 per cent; 1916 was a year in which mussel infection prevailed, as were also 1919 and 1920, while 1917 and 1918 were not. It must be admitted, however, that the period of the war is not a good time to which to apply the test, as variations might occur from failure to notify.

I have, therefore, had figures taken out by Mr. Dunks for seven years, having first gone through the inspectors' investigation sheets. Even in the years of more intense enquiry it is remarkable how different are the general enquiries from those made by a special investigator, and reference to the case papers will amply establish this. I have also taken out the figures for three years in which the facts were most fully and carefully investigated, and have given the death rates at groups of ages, males and females separately, for all cases, and for shellfish cases. When the facts were not subjected to this fuller enquiry, it was evident that many, and these the more fatal cases, were not cleared up at all. Not rarely this happened owing to the severity of the attack, which precluded questioning the patient. It cannot be claimed, therefore, that this enquiry fully settles the question. Taking the figures as they stand, however, they do not support the view that shellfish cases are more severe on the average than other cases. Hence the case mortality in any given year throws no light on the degree of shellfish contamination in that year.

The investigation of these cases was especially thorough from 1903 to 1912, and it is a kind of work which eminently requires both time and training. It is necessary, perhaps, to repeat that a special investigator is needed for this work, and also for other epidemiological enquiries, whom the Medical Officer of Health should himself train.

It is difficult to trace the ramifications of shellfish infection, as besides the cases which have been traced there were others who were probably infected when intoxicated. It was quite usual for persons in that condition to partake of mussels, and subsequently to have only a vague idea of when they had consumed shellfish. Probably not a few had altogether forgotten having eaten them.

It is evident from Dr. McClure's report for 1921 that the danger is not over, and that enteric fever is being kept alive by mussel infection just when it showed signs of dying out.

ENTERIC FEVER AND SHELLFISH.

Age.		1903-1908 and 1912.						1905, 1906 and 1912.					
		Cases.		Deaths.		Per cent Mortality.		Cases.		Deaths.		Per cent Mortality.	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
0-4	Shellfish	3	2	..	..	..	..	2	2	..	..	..	..
	Other	73	58	9	4	12.3	7.0	32	29	3	2	9.3	7.0
5-9	Shellfish	14	6	1	..	7.1	..	8	4	..	..	..	..
	Other	106	102	10	9	9.4	8.8	38	45	2	5	5.3	11.1
10-14	Shellfish	25	18	2	2	8.0	11.1	14	11	1	1	7.1	10.0
	Other	141	98	17	8	12.0	8.2	48	47	8	5	16.6	10.7
15-19	Shellfish	57	15	5	2	8.8	13.3	28	8	2	2	7.2	25.0
	Other	117	87	24	14	20.5	16.0	34	38	6	4	17.6	10.5
20-24	Shellfish	93	22	18	8	19.3	36.4	30	11	10	2	33.3	18.2
	Other	120	95	26	11	21.7	11.6	34	35	8	3	23.5	8.6
25-34	Shellfish	189	62	48	12	25.4	19.4	94	38	21	7	22.3	18.4
	Other	202	189	56	36	27.7	19.0	73	75	19	19	26.0	25.2
35-44	Shellfish	75	28	15	5	20.0	18.0	42	17	11	3	26.2	17.7
	Other	101	65	35	27	34.6	41.5	33	16	9	6	21.3	37.5
45-54	Shellfish	21	15	3	3	14.3	20.0	10	9	1	2	10.0	22.2
	Other	52	49	17	15	32.7	28.8	20	16	9	3	45.0	18.8
55-64	Shellfish	4	2	1	1	25.0	50.0	4	5	1	1	25.0	20.0
	Other	13	18	5	6	38.5	33.3	4	5	1	1	25.0	20.0
65	Shellfish	2	1	..	..	..	..	2	2	2	..	100	..
	Other	3	3	3	1	100	33.3	2	2	2	..	100	..

DIRECT INFECTION.

To this cause are ascribed all cases which have been in intimate contact or association with previous cases at a period when infection could have been conveyed. It thus includes many persons attending on the sick, such as husbands and wives, nursing helps, and professional nurses. But it also includes children in the sick household, washer-women apparently infected from clothing, and others. It must be remembered that the dried excreta of enteric cases are infective, and no doubt some at least of the nursing cases and of family contacts have been infected in that way. To this group may belong the not infrequent cases commencing with bronchitis or pneumonia. Then, again, members of a family in which there is a case of enteric fever are liable to infection by eating food which has been handled by careless attendants on the sick. It is often not possible to determine the exact manner in which the disease has passed from one person to another.

Lists of persons infected directly are given in successive annual reports, but as is the case with mussels, the investigations require to be intensive, and are not to be relied upon, at all events when negative, unless carried out by a skilful and trained enquirer working under the Medical Officer of Health.

A feature of these cases is the large number of children who would be overlooked were it not for careful and special enquiry, checked by bacteriological investigation, so much so that the distribution in age groups of cases of enteric fever would certainly have undergone much alteration had all the cases occurring in children been ascertained and included, and, in fact, has been to no small extent modified by the number discovered.

There is no small danger in the diarrhoea season that cases of enteric fever, especially in children, will be regarded as attacks of diarrhoea, and, as overlooked cases always do, will propagate the disease. I have personally, in the course of enquiry into summer diarrhoea, come across one or two such cases, and they occur not infrequently in the inspectors' investigation sheets. It is a danger not possible to avert, but it could be diminished by the appointment of a special investigator.

The history of enteric fever in 1905, in which year the cases due to direct infection were resolved, with Mr. Hewitt's assistance, into a series of nests, is a wonderful piece of work, while he also discovered 99 mussel cases in the same year. Of these, however, 5, and 5 only, had possible histories of infection from other sources, unlike the small series in 1904. Dr. Cunningham's shellfish cases in 1912 numbered 108, of which none were in relation with other sources of infection.

This subject is too long to enter into more minutely.

Another source of infection was flies in autumn. This was a much greater danger so long as midden privies and pails existed, but has now shrunk to small dimensions since middens and pails have nearly been abolished. That part of the enteric curve which corresponded to the diarrhoea rise has largely disappeared. The danger, however, is not actually over since children suffering from diarrhoea and enteric fever continue to deposit their excreta both at home and in passages in positions where they can be visited by flies. Still, with the diminution in cases of enteric fever, and the almost entire disappearance of infected places such as middens and pails, it has greatly diminished. The two factors with which we have now chiefly to deal are direct infection and shellfish. In 1910 appeared a paper in the Epidemiological Transactions of the Royal Society of Medicine, which shows the extent and waning of the fly influence.

But these are not the only known sources of enteric fever with which we have to contend.

Many outbreaks have occurred due to contaminated water, and on one occasion an outlying district supplied with Manchester water called attention to the presence of faecal organisms in the water.

Many outbreaks also, have been traced to contaminated milk. Not a few of these have occurred in winter, and it is somewhat doubtful whether in these any great multiplication of bacteria occurred. It is, however, certain that milk can convey infection, and that quite fresh milk, under favourable conditions, is capable of providing a pabulum for the growth of the typhoid bacillus.

In 1900, a small outbreak of enteric fever occurred in the round of a milk dealer, whose place of business was in Manchester, but whose round was mostly in Salford. After some enquiry it was discovered that the milk dealer had been laid up for a considerable time with pneumonia, and that his wife, who was also his nurse, was attending to the business. He was evidently suffering from enteric fever, and was removed to Monsall Hospital.

In the same year a considerable outbreak of food poisoning was due to the sale in Salford of ice cream, made by an ice-cream maker near Great Ancoats Street, Manchester. About 50 persons were affected, though there were no deaths. The bacteriology was investigated by Professor Delépine, who found that much contamination had occurred. What had, apparently, happened was this. The ice cream, after being made, was placed in the freezing pail, and was then exposed for some time in a small yard, which contained also a pail-closet and an ashbox. There being a high wind the contaminated ashes were blown into the pail, and the temperature being favourable for growth, the germs, many of them of the Coli group, multiplied rapidly. After some exposure, the freezing pail was conveyed to a cellar, where it was no longer exposed to

contamination. A very decided danger from ice-cream making was thus revealed. Should any contamination reach the ice-cream mixture after freezing, it has every opportunity of multiplying unless the mixture is at once frozen. Rules were accordingly framed and distributed for the conduct of ice-cream makers, and considerable activity was shown in the inspection and improvement, or, if need were, suppression of premises for the making of ice creams. Plans were framed for small model premises, and a proposal was put forward, but not carried, to provide a model place to be let to small ice-cream makers.

However, the essential point was, and is, that the making of ice cream is attended with special risks of infection, unless very special precautions are taken. (Full directions are available for the guidance of ice cream makers.)

In the year 1910 an outbreak of enteric fever, and also of some closely-allied affections, began in Ardwick, and investigations were immediately instituted. This infection was due to the presence of enteric fever in the house of an Italian living in Gun Street, who worked, along with a number of other makers, at premises in Great Ancoats Street. Unfortunately, some of these also became infected, and infected their ice cream, which was sold in Eccles. A considerable outbreak of enteric fever occurred in that district, about 180 persons being attacked. The Medical Officer of Health for Eccles requested assistance from the Local Government Board, and Dr. S. McNckton Copeman, F.R.S., came down to make an enquiry. We could not, however, have prevented the outbreak, as our own information was only available after infection had been disseminated.

In all, 84 cases came in Manchester into relation with the previous consumption of ice cream from suspicious sources, or omitting 15 which might have been due to other sources, 69 cases. A full account of the origin of this outbreak was laid before the Sanitary Committee, and ordered to be printed. The action incidental to the outbreak is therein set forth, and with the report is incorporated an elaborate investigation by Dr. J. R. Hutchinson into the history of ice-cream cases in Manchester, in which he arrives at the conclusion that there was no evidence of any previous diffusion of enteric fever by ice cream in this City. This investigation was made possible by the investigation forms on which the inspectors had for many years recorded the results of their enquiries into ice cream and other causes of enteric fever. Notwithstanding this general conclusion, one would not venture to say that no infection had previously arisen from ice cream, and in any case the danger is evident and serious. The chief precaution is to ensure the protection of the ice-cream mixture while it is being cooled, or else to require immediate cooling and freezing after boiling.

At the present time the inspection of milkshops and ice-cream factories is utterly inadequate. Col. Brittlebank is in charge of this section of the work. But, in order to carry it out satisfactorily and to carry on the enquiries which the Medical Officer of Health requires, at least one, and probably two, additional, carefully-selected inspectors will be required.

Regular detailed reports should be made of ice cream places and milk shops, with a statement of the action needed, if any, and such reports should be placed before the Hospitals Sub-Committee.

Various other foods have come under suspicion with more or less probability. All foods, of course, kept in an infected house are liable to be a source of danger if handled by the attendant on a case treated at home, or if no special precautions are taken. This is particularly the case in regard to any shop at which foodstuffs of any sort are sold—to be eaten without further cooking—and which is part of a house in which enteric fever is being treated. There is danger, also, in selling other foodstuffs which have been in contact with, or exposed to, contamination from shellfish, especially mussels.

Watercress has been charged with spreading enteric fever, and contamination was formerly traced to beds of this vegetable. But there is probably little of this danger left, and one has never been able to produce any proof of infection in Manchester.

Another source of risk is ripe fruit, which could only be contaminated by infected hands or flies. The general decline of enteric fever has much reduced this risk.

The danger of conveyance by flies is not over, notwithstanding the conversion of middens and pails to water-closets, as will be seen by studying the notification figures week by week for the year 1911. They show that the "fly rise" in the enteric curve was quite evident in that year, notwithstanding the great reduction which had taken place in the number of pails and middens.

Wherever there are children suffering from diarrhoea—an affection which often cloaks enteric fever—there will be deposits of excreta, and therewith danger of the spread of enteric fever.

It is, therefore, necessary to continue strenuously the campaign to secure every seven days complete and entire removal of all horse manure, and therefore to ensure that the conditions are such as will enable this to be done.

A great effort was made in 1921-22 to secure this object, but by no single thing has one been so much baffled as by this. Only by continued and resolute action can the abolition of the housefly plague be secured, or, at all events, its reduction to comparatively small proportions, in which case it is comparatively harmless.

But it is necessary to remember that any collection of organic refuse will suffice for its propagation in a hot summer, and in such a season will need as much vigilance as horse manure. This applies especially to tips on which organic refuse is deposited. In colder seasons, horse manure alone, through its fermentation and heating, supplies the conditions necessary for the breeding of flies in large numbers. In warm seasons all organic refuse, heaps of manure on allotments, and so forth, are warmed up and become breeding grounds.

CARRIER CASES.

It has been calculated that about 1 to 2 per cent of cases of enteric fever continue to excrete by the bowel or in the urine masses of bacilli. These reside especially in the gall bladder, and are liable to multiply there, especially if the mucous membrane of the gall bladder is at all inflamed. In 1897 an outbreak of enteric fever occurred among the nurses at St. Mary's Old Hospital. I was led by an analysis of the cases to believe that some one of the several patients in a small ward must be infecting them. One of the patients gave the serum reaction for enteric fever, and was removed to Monsall Hospital, her obvious disease being carcinoma. She died there, and a post mortem examination was made, but no evidence of enteric fever was found—as it would not be. At that time carrier cases were not known, and the special liability of the gall bladder to harbour bacilli was not known. However, the spleen was sent to Professor Delépine, and, I believe, the spleen only. No enteric bacilli were found, and this again was not surprising, as the methods for its discrimination from other coliform micro-organisms had not been fully worked out. A strong impression was left, however, that this woman had been the cause of the outbreak amongst the nurses.

Numerous cases have since presented themselves amongst the persons in contact with cases of enteric fever, too numerous, in fact, to be sent into the hospital for samples of the excreta and urine to be taken. But in 1907 a woman was discovered by Inspector Hewitt, who had, in 1905 and 1906, infected at least four persons, and who appeared then to have infected a fifth. No serum reaction was then present, and it was not until another case occurred in 1908 that she was fully examined by Dr. Hutchinson, with precautions advised by Professor Delépine. On this occasion she gave a serum reaction, and her excreta contained multitudes of bacilli. Dr. Hutchinson also discovered the existence of a case whom she had infected as far back as 1898. Conditions were prescribed for her mode of living. But, again in 1912, when the enteric cases were under the care of Dr. Cunningham, another case, a lodger, contracted enteric fever, and again she was proved to be excreting bacilli. She was removed to hospital and received a special course of

treatment, under which she ceased to excrete bacilli. But she had only been discharged a short time when the excretion of bacilli recommenced. Dr. Cunningham then suggested that the Sanitary Committee should make her a grant, which, along with her old age pension, should just enable her to live, on the condition that she should cease to take in lodgers. No further infection is known to have occurred, and she died in 1913 at the age of 74. Dr. Hutchinson discovered two more cases whom he believed to be carriers, one of whom disappeared. But neither is known to have had an after history of infection.

A number of patients who gave a reaction with the blood-serum test have been at one time or another sent into Monsall Hospital, and samples sent to Professor Delépine. But no other case turned up except one recorded in the account given by Dr. McClure of enteric fever in 1914. In 1915 a group of cases (some 10 in number) occurred in the rounds of two milk sellers, both of whom obtained supplies from one milk dealer. Of three employees of this milk dealer, one and the milk dealer himself gave a serum reaction. Both had their excreta examined, when the milk dealer himself was found to be excreting typhoid bacilli. No subsequent infection was traced to him.

I cannot believe that "carrier" cases play an important part in the spread of enteric fever. But it must be admitted that such cases, when they do occur, must act as foci of infection, and also that, in the absence of careful investigation, they are apt to escape attention. For a number of years all contacts with cases of enteric fever have been submitted to the serum test, and quite a number have been found to give a reaction without any history of infection. It is a useful precaution to have excreta from all such cases examined bacteriologically as a routine, and this has, in fact, been carried out.

During the war attention was called pointedly to the occurrence of cases clinically resembling enteric fever, though less fatal, the bacilli obtained from which gave different reactions to the bacillus of typhoid fever. These are known as cases of paratyphoid A, B, and C, and it has been thought desirable to distinguish them. Observations by Dr. McClure on this subject will be found in the Annual Report for 1921.

This discrimination, though expensive, may prove valuable in future enquiries into the incidence of enteric fever. It can only be conducted by skilful trained bacteriologists.

It is, in my opinion, desirable that the Corporation should have a laboratory of their own in which to carry out public health work and special enquiries. It would be difficult, if not impossible, to replace Professor Delépine, but a laboratory guided by public health needs, and also serving the wants of practitioners, is much wanted, especially if the character of the work carried out in the Public Health laboratory at York Place is going to be altered.

OVERLOOKED CASES.

At the period when special investigation was made into individual cases of enteric fever, say, from 1901 to 10 and in 1912, and more particularly in 1905, the immense number of overlooked cases, especially in children, was a very striking fact, which would have been but little in evidence but for Mr. Hewitt's enquiries. I estimated that at least as many cases were overlooked as were ascertained.

The resolution of cases into nests in 1905 helped to explain an old observation that persons coming into an enteric-affected district are much more liable to contract the disease than the residents, the explanation being that the residents are already protected. A further inference may be drawn—that it is not so easy to extinguish as to reduce the disease.

POVERTY.

In 1904 the observation was made that these nests of enteric fever occurred particularly amongst poor families. It is a common belief that enteric fever is not so much influenced by poverty in its incidence as are some other infectious diseases, such as phthisis, or typhus. This is certainly an error, and arises no doubt from the incidence of water, milk and shellfish outbreaks. But it does not apply to the more prevalent direct infections.

SHELLFISH.

It is impossible to say what has been the effect on the reduction of enteric fever through shellfish. It is, however, the fact that for over 20 years pressure has been brought on the Markets Committee to assist in reducing this source of disease. In 1908, Dr. J. R. Hutchinson states that the Markets Committee are considering measures for the purification of layings. Their Chief Inspector, Mr. Minor, has at various times been active in the matter. Had nothing else been done, the publication of our annual investigations must have helped to form public opinion. It is to be hoped that this matter will not be allowed to rest until security has been obtained that any supply of shellfish put on the market is uncontaminated by sewage.

ENTERIC FEVER IN INSTITUTIONS.

Outbreaks of enteric fever in institutions are not rare, and it is a singular thing how unsatisfactory have been the investigations into their causes.

In 1897 three such outbreaks occurred—one among the nurses in the enteric fever ward at Monsall Hospital. It was easy to show that the conditions of the closets were unsatisfactory, but I did not then believe that this was the cause of the outbreak, and the medical superintendent, Dr. Marsden, and I were agreed that the cases may have been due either to defective care of the hands, or to the shaking off of dried enteric infection in making the beds. We issued instructions accordingly.

A second and more considerable outbreak occurred in the Boys' Refuge, Strangeways. Here grossly insanitary conditions prevailed in the closets, and the outbreak may have been due to this cause. A third outbreak, at Old St. Mary's Hospital among the nurses, I was inclined to ascribe to what would now be called a carrier case. Here, also, there was a defective and leaking closet. Dr. McClure had to deal with a small outbreak in an institution, which he ascribed to the introduction of an enteric case, but he does not throw light on the mode of spread of the disease. Naturally, in any modern outbreak, the presence of an infective person would be diligently sought for, though not to the exclusion of other possible sources.

At various times nurses at other institutions have mysteriously been attacked by enteric. Such occurrences demand very searching enquiry in the light of acquired experience, presenting as they do the opportunity of eliminating some of the factors.

In 1905 some cases occurred in the diphtheria ward at Monsall Hospital, having been introduced apparently by a case of enteric fever, which simulated diphtheris, as enteric cases sometimes do. The infection in this case would, most probably, be conveyed by the hands of the nurses, but not necessarily.

These occurrences serve to show how difficult it is to trace with precision the paths by which enteric fever is conveyed.

In the Annual Report for 1907 is given a review of the conclusions with regard to the prevention of enteric fever reached up to that time, which, I think, needs no amplification. Although the disease appears now to have reached comparatively small proportions, it is still necessary not to relax our efforts for its suppression, and the measures there advocated still apply.

Those measures were :—

- (a) The abolition of middens, privies and pail-closets. (This is practically done.)
- (c) The protection of foodstuffs from the visits of the housefly whether at home or in shops.
- (d) The storage of manure and vegetable refuse in such a manner as to prevent as far as practicable the multiplication of houseflies.
- (e) Tips for domestic refuse should contain only such organic matter as has passed through a destructor.

(f) Adequate measures should be taken to ensure the purity of shellfish layings.

(g) An effort should be made to stop the consumption of shellfish in a raw state.

(h) Ice-cream makers should be adequately instructed and supervised.

(k) Medical practitioners should have their attention drawn to the ease with which attacks of enteric fever may be overlooked, and in particular to the manner in which attacks of diarrhoea conceal the disease.

(l) The most important measure of all is the continuous, careful, and adequate investigation by a trained and skilled investigator of all individual cases of the disease, with such action consequent on his investigations as may seem necessary. No routine methods can replace this requirement.

I have discussed the subject of enteric fever also in the paper quoted above, "The Housefly in Relation to Summer Diarrhoea and Enteric Fever," Proceedings of the Royal Society of Medicine, 1910. On pages 48 and 49 will be found two composite statements of the weekly incidence of cases of enteric fever. Taking into account the fact that on the English and Welsh shores there is a close season for mussels, from the end of April to September, the behaviour of the curves after the end of April strongly suggests that mussels take a great part in maintaining enteric fever.

TYPHUS FEVER.

Fortunately we have had very little experience of this formidable disease. But in the time of my predecessor, Mr. John Leigh, it made quite a considerable appearance. In 1891 there were 16 cases. In no other year did the number exceed 2 or 3, though about 15 years ago it is interesting to recall that Dr. Thomas Carnwath, then Medical Officer of Health for Withington, underwent an attack, after making a post-mortem examination on the body of a person who had died of an obscure illness.

To this immunity there was one exception. At the end of 1900 and the beginning of 1901 an outbreak took place at a small rag-sorter's establishment off Great Ancoats Street. In the investigation of this occurrence I had the assistance of Dr. Harold Coates, afterwards Medical Officer of Health for Hornsey. A very singular feature of this was the fact that those attacked at this workshop all sat round one table near which the first person affected hung her cloak, as did also her workmates.

The cases more immediately connected numbered 20. But some extension occurred, and altogether the number rose to 40. Besides this,

a number were traced from one isolated case in Cheetham backwards for about seven months, ramifying in a kind of thin streak without lateral spread.

The households affected were wretchedly poor, and many of them were dirty and miserable.

At first it was very difficult to be sure of the diagnosis, as none of them had any rash. The most noticeable facts were the severity of some of the cases and the frequent presence of broncho pneumonia. The diseases at first thought of were enteric fever, plague and typhus. The first two were excluded by the bacteriological examinations; and the diagnosis of typhus was reached by a process of exclusion. Early in January, however, a case with distinct eruption about the body, arms and wrists was admitted into Monsall Hospital. After that a number of well-marked eruptions occurred.

In tracing the cases and linking them together the curve tracings at Crumpsall and Monsall Hospital were invaluable. In fact, it was as good as if one had been able to study the cases while they were ill. Hence, in a case of fever, no practitioner should ever omit to keep a chart of temperatures, morning and night, with a record of the pulse; and in hospital a four-hourly record is invaluable.

Some of the cases recovered in a comparatively short period, little over a week, a fact which helped to delay a definite diagnosis just at first.

Altogether 60 cases occurred in 1901 or were traced back, and 10 deaths occurred in 1901, so that the outbreak was sufficiently serious.

It was not suppressed without much effort. The details will be found in printed reports presented to the Council at the time. But suppressed it was completely, as soon as discovered, notwithstanding that we did not then possess the knowledge which we now have that the agent of communication is the body louse.

It is easy now, looking back, to see how this fact explains some features of the outbreak. Although the head louse is common enough in Manchester, the body louse is, by comparison, infrequent, and to this, no doubt, we must ascribe the difficulty which the disease encountered in passing from one person to another. Had the body louse been as common as it is in the near East, typhus fever would, doubtless, have established itself much more securely.

The subject is not by any means merely a theoretical one. With typhus fever raging in Russia and on its borders, we are in constant danger, a danger which will increase with the opening up of traffic with that country. Typhus is also endemic in Ireland, whose disturbed state and miserable condition may be expected to produce extension of the fever.

Under these circumstances, Public Health Authorities should possess increased powers for dealing with persons harbouring the body louse. On one occasion I had a family reported to me in a very lousy condition, and had the greatest difficulty in getting them even partially deloused. At present, no compulsory powers for delousing exist. But such powers will not mechanically solve any problem without very active investigation.

DIPHTHERIA.

When I came to Manchester in 1894, the bacteriology of diphtheria was already fully worked out, but had not been applied as a Public Health measure. At that period, diphtheria was both prevalent and very fatal, the case mortality being 30 per cent. Immediate steps were taken, with the assistance of Professor Delépine, to make the examination of swabs from the throat available to practitioners for purposes of diagnosis. Progress, however, was slow and uncertain, nor was there shown that immediate eagerness on the part of practitioners to use the diagnostic facilities which was afterwards displayed in the case of the serum reaction in typhoid. For this there were various reasons. Any delay interposed between the appearance of diphtheritic symptoms and removal to hospital, especially in the case of croup, was felt to be unsafe, quite justly. This was especially the case in severe and septic cases, particularly in the young, from whom it is difficult to get satisfactory swabs, and these are precisely the fatal cases unless effective action is immediately taken. Even when made, bacteriological examination did not always confirm the clinical diagnosis. Sometimes this was due to a layer of débris on the surface of the membrane interposed between the disease process and the surface, which did not contain the bacillus of diphtheria. It is true directions were given for evading these difficulties, but these directions were not, or could not be, always followed.

So great was the discrepancy between the bacteriological results of the swab and the clinical diagnosis that Professor Delépine felt himself obliged to write a statement for the Sanitary Committee explaining the discrepancies, which he did with his usual acumen and thoroughness. He certainly succeeded in showing that systematic examination of swabs is a useful public health measure.

Meanwhile the use of antitoxin was introduced for the cure of diphtheria. This substance is a serum obtained from the blood of the horse, which has been stimulated by repeated doses of the toxin of diphtheria to elaborate a substance which neutralises the poison of that disease. Diphtheria antitoxin was introduced in 1894, and a few years after the Sanitary Committee determined to supply antitoxic serum to

practitioners for the treatment of cases. A long controversy raged over the efficiency of the serum, although skilled clinical observers were generally agreed about its efficiency from the very first.

Medical opinion is now quite fixed upon the subject. Much of the doubt created was due to the delay in its administration, and it is now agreed that the results of treatment depend upon the period at which it is given. It cannot be relied upon to cure after the third day of the illness, and it appears to be useless to use it after the fifth day.

It must be admitted that the existence of such a remedy places an immense responsibility on the practitioner, as the life of his patient depends on his energy not merely in cases of croup, but in every case of diphtheria which he comes across. Diphtheria is a subtle disease which comes on painlessly, usually with some throat affection, and attracts attention chiefly by listlessness, loss of appetite and pallor, symptoms very easily overlooked, especially in cases which appear slight. Unless the relatives recognise the onset of illness, and unless the medical attendant is called in, and also promptly recognises the condition, the precious time is gone when treatment is of avail. If, however, antitoxic serum is injected at the commencement of the illness in adequate amount, the results are wonderful. The membrane clears off, and the patient improves directly. But with every day and hour lost the danger increases, and the dosage to be effective must be much higher on the third than on the first day of illness. The disease by no means always follows the classical course, and may begin abruptly, simulating scarlet fever, or other acute affection. It is never safe to overlook the possibility of an attack in throat or nasal affections, and, if there is any doubt, antitoxic serum should be given early.

There can be no doubt that the doses administered in the early days were inadequate, and possibly this had to do with the slowness with which the percentage of recoveries improved. The necessity for prompt treatment was recognised, however, at an early date, and practitioners were advised not to wait for the bacteriological diagnosis, but to inject antitoxic serum at once.

In order that this might be done, with the assistance of the Chief Constable, supplies of antitoxic serum were made available, with the use of a syringe, at the Public Health Office, also at the Detective Office, Town Hall, and at the various police stations. They were thus obtainable at week-ends. It takes time, however, for the vital importance of speedy action to be recognised, and it is only lately that the full importance of immediate treatment appears to have been realised; that is to say, if we are to regard the fall in the death rate and case mortality as proof that it has been realised.

It appears desirable at this point to give the available facts about the course of diphtheria in Manchester.

Attention may first be directed in Table I to the number of notified cases. This has fluctuated greatly from year to year, and while the figures have not followed closely those for scarlet fever, there is always a tendency for the notifications from diphtheria to decrease and increase with the notifications from scarlet fever. There is, in fact, a marked tendency to mix the two diseases. Both have an exudation on the tonsils, and both have enlargement of the glands connected with the tonsils. Besides, it often happens that persons have both diseases at one and the same time—a source of much difficulty in fever hospitals. Between 1893 and 1903 the number of notifications first decreases and then rises, after which period there is no second diminution, while in 1920 and 1921 there are great increases.

It is not easy to account for these changes, though it is permissible to suppose that medical practitioners are bestowing much more attention on diseases of the throat than they used to do, and are better acquainted with the mild forms which it may assume. In some such way we may explain the failure in the notifications to decline.

TABLE I.—DIPHTHERIA AND MEMBRANOUS CROUP.

Year.	No. of cases notified.	Case mortality, per cent.	Death rate.	Percentage of cases treated in hospital.	Death rate England and Wales.
1891.....	456	28·5	0·25	..	0·17
1892.....	497		0·25	..	0·22
1893.....	622		0·35	..	0·32
1894.....	512	28·1	0·29	22·6	0·28
1895.....	402	26·6	0·21	17·2	0·25
1896.....	239	30·6	0·15	18·4	0·29
1897.....	150	32·7	0·08	29·3	0·24
1898.....	196	28·1	0·09	36·8	0·24
1899.....	248	33·9	0·16	45·1	0·29
1900.....	337	30·0	0·19	56·1	0·27
1901.....	457	28·9	0·24	57·2	0·27
1902.....	422	29·4	0·22	59·5	0·23
1903.....	620	21·9	0·25	57·6	0·18
1904.....	474	20·7	0·18	49·6	0·17
1905.....	530	22·4	0·22	57·3	0·16
1906.....	551	21·1	0·20	47·4	..
1907.....	499	20·4	0·18	43·7	0·16
1908.....	546	21·8	0·20	49·8	0·15
1909.....	598	17·9	0·19	53·8	0·14
1910.....	498	19·9	0·16	59·4	0·12
1911.....	472	16·5	0·12	68·0	0·13
1912.....	474	20·0	0·13	62·8	0·11
1913.....	650	14·9	0·14	58·0	0·12
1914.....	746	14·3	0·15	53·2	0·15
1915.....	548	18·8	0·14	69·7	0·15
1916.....	614	11·7	0·09	69·5	0·14
1917.....	581	10·8	0·08	75·6	0·13
1918.....	518	10·8	0·08	78·3	0·14
1919.....	471	9·1	0·05	72·2	0·13
1920.....	914	7·3	0·09	72·3	0·15
1921.....	1,002	8·7	0·12	60·6	0·12

TABLE II.—DISTRIBUTION OF NOTIFIED CASES AND CASE MORTALITY IN AGE GROUPS.

Amongst the usual tables in annual reports will be found one which shows the numbers notified, the deaths, and the percentage of deaths at each year of age up to 10, then in five yearly groups up to 25, at 25-34, 35-44, and above 45 years of age. It will be seen that the case fatality—that is to say, the average severity of the cases—diminishes from the first year of life up to 45, after which it again increases. The incidence of the disease per 1,000 persons living occurs with greatest frequency at the ages 3 to 5, being highest at the age of 4. The figures for sex incidence have not been taken out, but it is known that after the age of 10 it is heaviest on females.

In the Annual Report for 1907, on page 48, is given a table showing, for the years 1897-1906, the average attack rate per 1,000 living, and also the average death rate per 1,000 of population for each of the sanitary districts, excluding Gorton, Levenshulme, Moss Side, Chorlton-cum-Hardy, and Didsbury East and West. The incidences on particular areas are liable to change from year to year, and over long periods very considerably, but the distribution for the period named does not differ considerably from that given by Dr. Tatham, as shown on a map in his Report on the Health of Manchester for 1891-93.

The heaviest incidence is on Cheetham, Crumpsall and Blackley taken together, though on the last named it is not so high as it is on Rusholme. Then come Moston and Clayton. It will be observed that all these are outlying districts. I am disposed to believe that incidence is determined partly by damp in the soil. If it were dependent merely on infection, these districts would scarcely show the heaviest incidence. The heaviest death rates fall upon a continuous area—Cheetham, Crumpsall, Blackley and Moston, followed by Hulme, Harpurhey and Rusholme. But this applies only to the period selected.

The severity of the disease or, in other words, the percentage of deaths to cases, has pursued a very different course. For a number of years up to 1902 there was no diminution in case mortality. This may be assumed to be the period when difference of opinion as to the value of antitoxin was most acute. But in 1903 there was a great drop, and the case fatality never rose again to its former level. Still it fluctuated about the same level up to 1908. In 1909 another fall occurred, and after 1913 there was a decided drop, since which year it has continued to fall until in 1920 and 1921 it appears to be no higher than a quarter of what it was in the earlier years. All this may not be due to real improvement. Some of it may be due to failure to distinguish between

diphtheria and septic sore throat in the earlier period. Then, again, the disease may have undergone a change of type, such as we have supposed to have occurred in scarlet fever by reduction of sepsis. But, on the other hand, it may be that it is due to medical practitioners administering antitoxin at an earlier stage of the disease, and being clearer as to the diagnosis. Or both factors may be in operation.

The death rate per 1,000 persons living, on the other hand, has not undergone continuous decline, a fact corresponding to the very different course pursued by the numbers notified.

From 1894 the death rate falls. Prior to this period it exceeds the death rate for England and Wales as a whole. From 1895-1902 it is below that of the country generally, and pursues quite a different course. From 1903-13 it is above that of England and Wales. In 1916 it passes definitely and decidedly below that of the country as a whole.

This is quite different from the behaviour of scarlet fever, and shows that the latter disease is subject to the influence of general meteorological conditions, which do not act in the same way on diphtheria. Diphtheria is much more subject to local influences. The death rate is at present ascending.

A column shows the percentage of cases treated in hospital, from which it will be seen that the great drop in the death rate which began in 1895 is not due to the hospital.

The increase in the percentage treated in the hospital in recent years coincides with the fall in the death rate. But the above fact shows that there is no relation of cause and effect, and indeed it was shown in one year—not a recent one—that there is liable in this disease to be a considerable number of return cases.

As has already been mentioned, diphtheria may invade the scarlet fever wards, and it has been found necessary, therefore, to examine every case for the diphtheria bacillus, and to isolate every case which proves to be a harbourer. Such cases are not discharged until they yield two negative swabs at least. The examinations apply to the nostrils as well as to the throat.

The comments made on Table II. (not inserted) have an important practical application. The facts there recorded make it necessary to use every possible means for the protection of very young children exposed to the infection of diphtheria. It is probably good practice to give prophylactic injections of antitoxin to all children under five who have been exposed to infection. It is, however, necessary to watch them closely afterwards, so that they may receive treatment by antitoxin as soon as they show any signs or symptoms of diphtheria.

Much effort has been expended on this disease in the hope that hints would be obtained for prevention. Its distribution was plotted out in sanitary districts month by month, on what I have called picture tables, from 1901 to 1907. These show that the disease gets scattered in little groups, now over one district, now over another, in a manner somewhat like the corresponding behaviour of enteric fever, and due no doubt to little rushes of infection. But there is not the same tendency to correspondence in seasons, and, indeed, there is great variety as to the degree and incidence in quarters from one year to another. That is to say, diphtheria is little dependent on seasonal influences. I have already shown under Table 1 that this is so.

It is important to know what is the relation of schools to the spread of diphtheria. The flares-up shown by the picture table to occur in districts have, undoubtedly, in part been due to schools. Thus, in 1903, considerable outbreaks occurred in Lloyd Street, Hulme, St. John's School, Cheetham, and Moston Lane Board School, Blackley. Further incidences are given in 1904. In the Report for 1907 I record briefly the results of a very able and exhaustive investigation by the late Dr. B. K. Goldsmith, on the incidence of diphtheria on Manchester schools for 1897-1906: "In the majority of schools—many of them large—no case of diphtheria had occurred for 10 years; in others, only odd cases. In others, again, the disease appeared to persist with a low degree of intensity, breaking out into a flare-up from time to time. In others, flares-up of very limited duration occurred without apparent antecedents. In all such cases we may assume almost confidently the presence of some case or cases of the persistently infective type."

Dr. Ritchie, acting with Dr. Forbes, had the children in a quiescent school examined, and three of them yielded diphtheria bacilli.

Dr. Forbes calls attention to the frequency of diphtheria bacilli in children with sores in a nostril, or with rhinorrhœal discharge, and such children should always have a bacteriological examination made. The serious aspect of school outbreaks is the high fatality which they cause by the infection of younger children at home. Conversely, diphtheria in younger children is liable to start an outbreak at school, either through an infected case or an infected carrier. Diphtheria needs always to be considered in relation to school, and every investigation made so as, if possible, to prevent the introduction of infection into school.

Of late all contacts are swabbed—with present arrangements an expensive matter, but probably an effective one if carriers are properly treated. It has been suggested that only children with rhinorrhœa should be examined when it becomes necessary to examine the children in a school. I am doubtful whether this is adequate. It has been suggested that in all positive contacts the bacilli isolated should be tested

for virulence—also a costly business. It is argued that, *per contra*, expenditure on hospital treatment is saved, and that non-virulent bacilli may be neglected. Probably this is good practice, our object being in all cases to render bacilli non-virulent so that a mild inoculation may occur.

Recent figures seem to show that the hospital does little or nothing to prevent the spread of diphtheria, owing to the large number of cases scattered about. All the same it is indispensable. All this has been pointed out before.

The truth appears to be that we are largely dependent on the medical practitioner to keep down diphtheria.

The following seem to be the cardinal rules to follow:—

1. Never to neglect or treat lightly anything in the nature of a sore throat, and always to have a bacteriological test taken.
2. To pay close attention to sores in or discharge from the nostril, and to take swabs for examination.
3. If there is any suspicion whatever of diphtheria, at once to administer a considerable dose—say, 2,000 units—of antitoxin. No harm need be anticipated, and it is a proper safeguard.
4. Carefully watch contacts, and be ready to treat them immediately. If very young children are present in the presence of infection, a prophylactic injection of 500 units should be given.

A new prospect of prevention has opened out in the Shick test, which emanated from New York, and has been tested at Edinburgh, Bristol and Manchester. This consists of injecting a very small dose of toxin into the skin. If the person injected is susceptible to diphtheria, a small pink areola develops in 48 hours round the seat of injection. This has to be distinguished from the pseudo reaction produced by protein in the toxin. The operation requires both skill and practice, and was well investigated by Dr. T. E. Dickinson at Monsall Hospital.

The value of this test is in determining the patients who are, and those who are not, susceptible. The latter may be immunised by one, two, or three injections of toxin antitoxin, and, as the procedure is without danger, nurses in attendance should have the protection, which, after two injections, is said to last for two years. It is proposed in New York to immunise on a large scale the children over one year found to be susceptible. Children under one year are insusceptible in a fairly high proportion, but rapidly become susceptible after they reach the age of one year. The practice of this protection will no doubt develop slowly in this country. But it appears to have a great future, and every encouragement should be given to work on the subject. Dr. Copeman reported for the Ministry on the prevention of diphtheria in 1921.

SUMMER DIARRHŒA (EPIDEMIC ENTERITIS).

This is a very fatal affection to infants, always taking a high place among the causes of infantile mortality. The most complete account of its features is given in Dr. Ballard's admirable investigations for the Local Government Board, and the course of the death rate per 1,000 living is shown in Table E of the general statistics in every Annual Report. It will be seen from that table that the annual death rate has undergone an immense reduction since the year 1891, if we are to measure it by the figures for the last few years. But the advance is in some measure only apparent. It is always low in such districts as Withington and Levenshulme. Also, it depends on the birth rate, which has greatly diminished. Given the same proportion of infants dying of diarrhœa, the annual death rate per 1,000 persons living would be higher the higher the birth rate, though not in proportion. From this cause, also, the reduction in the death rate appears greater than it is. Nevertheless, we may estimate that in recent years it is only half of what it was at the beginning of the period.

Every year, almost, there is a great uprush of deaths from diarrhœa, sometimes extending forward to October and even into November in warm seasons, or more rarely backward into July. Hence its name.

The course of the annual death rate has fluctuated greatly in successive quinquennia, and was much the highest in the five years 1896-1900. Its subsequent decline was interrupted in the years 1911-15, owing chiefly to a marked outburst in the year 1911.

The course of diarrhœal mortality is, however, best shown in the following table :—

NUMBER OF DEATHS FROM DIARRHŒAL DISEASES PER 1,000 BIRTHS.

1891.....	15·63	} 23·17	1906.....	39·84	} 19·93
1892.....	16·43		1907.....	12·14	
1893.....	35·48		1908.....	23·95	
1894.....	13·61		1909.....	11·06	
1895.....	34·68		1910.....	12·65	
1896.....	24·14	} 38·31	1911.....	45·04	} 24·19
1897.....	38·52		1912.....	10·95	
1898.....	45·46		1913.....	21·67	
1899.....	47·79		1914.....	22·09	
1900.....	35·64		1915.....	21·20	
1901.....	47·54	} 29·49	1916.....	13·93	} 11·52
1902.....	12·95		1917.....	15·50	
1903.....	22·14		1918.....	7·44	
1904.....	34·06		1919.....	9·62	
1905.....	30·78		1920.....	11·13	
		1921	17·95		

There can be no doubt about the favourable influence exerted on this disease by the abolition of middens and pail-closets. Yet the above facts show that, under unfavourable conditions, this influence can be entirely overcome. Considerable study was given to the disease in the

earlier years (from 1894 onwards), but it was felt that no working theory had been arrived at. Accordingly in the years 1903-06 an intensive study was devoted to its causation.

In those earlier years the distribution of the mortality rates between one sanitary district and another did not remain constant from one year to another. From this, and from the occurrence of the autumnal wave, it was inferred that diarrhoea was an infectious affection. But this did not throw any light on the nature of the infection or on the manner in which it was conveyed. It was observed that the death rates were always high in the sanitary divisions of the township which were served by pail-closets, but they were also high in the midden-privy districts—Bradford, West Gorton, Openshaw and Clayton. In hot summers, diarrhoea was high, and in such summers the midden-privy districts showed a relative increase in death rate to the pail-closet districts, a relation which also held in the case of enteric fever. It might be inferred that the midden privies had an influence on the death rates different from that exerted by pail-closet districts, or at least responding more readily to high temperatures, but wherein precisely the difference lay was not seen.

Ballard had shown that diarrhoea mortality began to make itself felt when the 4 ft. earth thermometer indicated 56 deg. Fah., rose in correspondence with its readings, and fell in correspondence with its fall. The suggestion was that, with the rising temperature, infected matter multiplied in the soil. But no proof was adduced of such an occurrence, nor does it explain the continued ascent of the diarrhoeal curve during rain, with consequent fall of temperature. In any case, it was an unfruitful hypothesis so far as practical action was concerned.

When, in 1903-06, an intensive study was made of the disease, with the assistance of Inspector Hewitt, it was found that many cases could with much probability be put down to direct infection from one person to another.

Much could also be ascribed to contaminated milk. Ignorance, carelessness, intemperance on the part of the mothers were much in evidence. They rubbed the infants' gums with dirty fingers, gave them dirty comforters to suck, fed quite young babies with solid food, put them down on dirty floors, and committed all sorts of mistakes which were bound to, and did, injure the child's digestive organs.

At as early a date as 1894 I began to agitate for the education of the older girls in school, and of those who had left school, in the management of children, especially as regards feeding, of which the poorer mothers were usually quite ignorant. But even supposing that such measures availed to reduce diarrhoeal mortality, it was still necessary to explain the autumnal rise in which occurred the greater part of the mortality. Contamination of milk could not explain it. July was often hotter

than August, yet no rise occurred. Direct infection from case to case could not explain it for the same reason. Again, for the same reason, dispersal of dust was an inadequate explanation, and it was evident that the mere presence of midden privies and pail-closets could not explain it. Nor could it be explained merely by high temperature alone.

The causative factors or agents, whatever their nature, must rise and fall with the rise and fall of cases and deaths.

The periods between attack and death were worked out. The largest number were within a week, and the great majority were in the first fortnight.

But the intensive study showed that the cases varied greatly in duration, many of them being suggestive of enteric fever, as was also found in our studies on enteric fever. Many more appeared to be of tuberculous origin, or at least to form the terminal stage of tuberculosis. But even excluding these, diarrhoea took on various formidable shapes. It was manifest that within the term diarrhoea more than one disease was included. Dr. Ballard's investigations had given a like conclusion.

In 1903 I turned my attention to the housefly as a possible agent for the conveyance of infection. Attention had been previously called to the housefly as a possible agent of transmission by several observers, but no attempt, so far as I know, had been made to prove that the housefly was a main factor.

If houseflies were the missing agent they must rise and fall in number with the number of cases or deaths, and must precede the rise and fall of deaths. It was, therefore, necessary to number them, and to see whether the necessary relation held year by year. For this purpose, arrangements were made through the Ladies' Public Health Society for traps to be cleaned and set daily by reliable householders, for a daily count of the flies caught to be made, and for a register to be kept.

The numbers from the different stations were then added up for each week, and compared with the numbers of deaths week by week. The whole of the facts and considerations are set out in the Proceedings of the Royal Society for April, 1910, and curves are given for five years, showing the number of deaths of fatal cases of diarrhoea during the autumnal wave side by side with the numbers commencing to be ill, distributed as well as could be done in their respective weeks, with the numbers of flies captured, with the readings of the 4 ft. earth thermometer, the 1 ft. thermometer, and of the atmospheric temperature; also the rainfall.

It needs no discussion to see that the curves of flies stand in much closer relation with the curves of deaths than do those of temperatures. Rainfall shows no association whatever. In fact, considering the fewness

of the stations and the many errors involved, the degree of closeness is almost startling.

A strong case was therefore established for the housefly as the transmitting agent in infection and the causal agent of the summer rise in diarrhoea.

It remained to show that the housefly was capable of carrying infection. In an enquiry carried out by Dr. Sellers, with the assistance of Professor Delépine, this was abundantly proved (see Annual Report, 1906). There was, however, very little evidence of the conveyance of colon bacilli. But this was undoubtedly due to the small number of flies investigated.

In the same year Morgan described a coliform bacillus which he believed to be the cause of summer diarrhoea. However, the subject was thoroughly studied by Graham Smith, and his results are set forth in his fascinating work on "Flies and Disease, 1914." He has shown that the housefly carries bacilli of the colon group not only on its body, but also in its proboscis, and deposits them in its excreta.

That it does not do so more abundantly is matter for congratulation. But if one considers the migratory habits of flies, at all events as between house and house, the enormous numbers in which they occur in individual houses, the fact that they breed in contaminated middens, and visit them to lay their eggs and probably to obtain moist food in dry periods, it cannot well be doubted that they bring much infection into the house.

It is even doubtful whether they absolutely need the presence of middens to carry out their work of propagation. In the diarrhoea season there are always numbers of excretal deposits both out and inside the house, made by children suffering from diarrhoea, which flies can visit. Moreover, flies swarm round the mouths of children suffering from diarrhoea and doubtless pick up infection there. When my observations were made, baking day was still a Lancashire institution, and caused swarms of flies to collect. These, of course, came from houses in which it was not baking day, and ample proof was obtained of the migration of flies from one house to another and of their visits to middens and pail-closets.

But it must be owned that we cannot rely on the abolition of middens and pails to do away with their influence. The great outburst of 1911 is sufficient proof of this. Still, it has been a help in reducing the number of flies, and still more in reducing the opportunities of their acquiring infection.

In the absence of any other provable agent of transmission of epidemic enteritis, and having to our hands the remarkable correspondence between the number of flies and the number of deaths week by week, we are, I think, justified in concluding that we have probably found the cause of the summer wave of diarrhoea. All the different features of the yearly

rise, and of the behaviour of the disease in districts, now finds an explanation, though for the fuller justification of this statement I must refer to my Annual Reports of 1903 to 1909, and to the paper just quoted.

It may be noted that there are two kinds of housefly, the smaller (*homalomyia*), which can stand cold better than the larger (*musca*), and, therefore, makes its appearance earlier (May, June and July). Later on, it is so much outnumbered by *musca* that the two were enumerated together. *Homalomyia* may, however, help to start the annual wave.

If, now, flies are the cause of the great uprush of diarrhoea, our attention is drawn in two directions. One direction is the removal of foci of infection. The experience of 1911 shows that this can only be partially successful. The other direction is the destruction of the housefly.

Now how is this to be effected? When the fly swarm has once flown, the American-born cry arises of "Swat that fly." This is all right as far as it goes, but as a measure of prevention it is perfectly useless. It is the numbers that tell. Quite probably flies are more infective at one part of the fly season than at another, but the facts appear to show that flies must be in very large numbers before they can effect much in carrying infection, and our object must be to prevent them reaching those numbers.

To do this we must know their habits of breeding and destroy the brood. A great deal of study has been given to this matter, and somewhere about 1904 Mr. C. G. Hewitt, then at Manchester University, directed his attention to it. The result of his study is given in a little book on houseflies and how they spread the disease.

But Inspectors Higginbotham, Lord and Price have also given me much help in tracking out what actually happens. The eggs of the housefly take a day or two to yield up the larvæ which grow from them, and in very favourable circumstances, such as the top of a fermenting heap of horse manure, the complete fly is liberated in about eight days, though it takes some days longer before it can fly easily. In this helpless stage it is called an imago. Horse manure, by reason of its high temperature due to fermentation, is the chief seat of fly breeding for *musca*, the common or larger housefly, and collections of horse manure contain often enormous quantities of larvæ, or of the pupæ which occupy an intermediate stage between the larvæ and the housefly.

In cold seasons, the housefly succeeds in producing fresh broods only in large collections of horse manure.

The eggs and larvæ require warmth. But the larva must have moisture to enable it to feed and grow, which it seeks either in heaps of

moist manure or down below at the bottom of a manure heap. When it is mature it changes into a pupa, a small coppery oval object with a tough outer skin, which requires warmth and dryness to develop into a fly. The larva crawls, therefore, into the chinks of defective middens, to pupate, or into any place which will ensure dryness.

It will be understood, therefore, that the necessary condition to prevent broods of flies is to carry all collections of manure away out of the City every seven days, or else at once to destroy them. At the same time the bottom and walls of the manurestead must be so constructed as to leave no chinks or places where the larvæ can pupate.

Pupæ often collect in the bottom of manuresteads if there is, mistakenly, an outlet for drainage. It will be understood that partial removal of manure is insufficient. Every scrap must be cleaned up.

In the colder summers this alone will suffice. In warm summers the housefly lays its eggs in every situation in which there is organic refuse which will feed the larvæ, as there is then external heat enough and moisture enough, even without the high temperature obtained from the fermentation of horse manure, to enable them to complete the cycle.

All tips of organic refuse then breed enormous numbers of flies, and you may see the walls of rooms in houses bordering a tip spotted thickly with fly dirt. Middens and pail-closets used to be favourite spots, and the privy midden supplied every necessary condition for development and nourishment, hence the increase of diarrhoeal mortality in privy midden districts in warm years.

There should, of course, be no tips within the City of undestructured organic refuse of any sort, vegetables, street sweepings, paper or other materials.

In 1909 byelaws were obtained for the regulation of middens for horse manure and other animal manures. These were amended in 1921, seven days being substituted for a week, as not being an ambiguous term, during which horse manure might be kept before removal. But the byelaws suffer from a more serious defect which we were not able to remedy. They only require removal and do not specify the distance. Manure might be removed to another depot a few yards off and a whole brood of flies might be generated under the byelaws, since the manure might be in the second depot for a fortnight after its production. Nor is this by any means an imaginary case.

In the meantime, all that can be done is to watch such common deposits, and to prosecute the proprietors under the Public Health Act, 1875, for the creation of a nuisance injurious to health should pupæ or imagines be demonstrable.

Fortunately, the removal of manure from joint middensteads is often quite frequent.

Another evil has sprung up within recent years in the storing of heaps of manure on allotments on which numerous pupæ have been found. There were some instances of serious nuisance from flies last year from the neighbourhood of allotments, and in warm seasons these collections may add very seriously to the number of flies.

In this case the remedy is easy. All such collections should be buried in trenches, and covered with earth well stamped down until they are wanted. Certainly it means a little extra trouble. But it is a strange thing that a privileged class of persons, who enjoy a boon which many another citizen would gladly possess, should be willing to contribute to this fatal disease of the community. No hesitation need be felt in dealing with such collections under the Public Health Act when they can be shown to be producing broods of flies.

To what now are we to attribute the recent improvement in the diarrhoeal death rate. There are, I think, two causes. One is the gradual increase in the health visiting staff and the steady course of instruction given by them to mothers in the care of their infants, this supplemented by the education of mothers at the Child Welfare Centres. For we must not forget that a large proportion of the children who fall victims to fatal diarrhoea have had the ground prepared for it in bad health due to mismanagement and improper feeding.

Another cause is the steady pressure brought to bear for many years, but more particularly during the war, to secure the speedy removal of horse manure to the country. In this we are baffled on the one hand by the horse proprietor, and on the other by the housefly, which displays an extraordinary ingenuity in securing the continuation of the race, especially in hot seasons.

Some means ought to be found to secure the regular and complete removal to some situation well removed from the City of horse manure within seven days of production, without the eternal watching necessary to see that this requirement is not evaded.

Last year I made a great final effort to secure proper conditions of storage, but the task is not an easy one.

It is no small matter that in 1918 the death rate from diarrhoea was below that not only from London but for the whole of England and Wales, while in 1921 it is below that in London.

There is, to my mind, no doubt that in a continued determination to baffle the housefly lies one way to reduce this scourge.

Allusion should be made to the investigations by Dr. M. B. Arnold at Monsall Hospital into the distances which houseflies can traverse, and to the investigations of Dr. Copeman, F.R.S., into this and other matters connected with houseflies.

SMALLPOX.

My first experience of smallpox was obtained as assistant to Dr. John MacCombie in what was then called Deptford Hospital, in 1881, and is recorded in the *Edinburgh Medical Journal*, 1883 and 1884. In 1886 I became Medical Officer of Health for the Borough of Oldham, and had the opportunity of dealing with two outbreaks of smallpox—one in 1888 and one in 1893. In March, 1894, I was appointed Medical Officer of Health to Manchester towards what appeared to be the conclusion of an outbreak of smallpox extending from 1892-94. There was another outbreak in 1902-04. Particulars of these occurrences are recorded in the Annual Reports of the Medical Officer of Health. In Oldham, I was Director and Medical Superintendent of the Fever and Smallpox Hospital, and had sole charge both of the public health and smallpox arrangements.

Adjoining the Smallpox Hospital was the sanitary district of Chadderton. In 1888 a considerable prevalence of smallpox occurred in Chadderton, and the Medical Officer of Health for that district, Dr. Patterson, well known for his efforts to reduce the smoke nuisance from factory chimneys, made a statement to his authority charging the Oldham Fever Hospital with the dissemination of smallpox in his district. This statement was forwarded to the Oldham Town Council, and it became my duty to investigate the circumstances.

At that period, Sir W. H. Power's investigations into the alleged dissemination of smallpox aërially round smallpox hospitals had recently been published, and, having read them carefully, I was prepared to accept them substantially.

The investigation which I then made, and which was printed, led me to the conclusions that (1) at the commencement of the outbreak in Chadderton the meteorological conditions did not favour the aërial dissemination of smallpox, (2) the greater part of the outbreak was due to direct infection, (3) there had been a number of overlooked cases, and the occurrence of the disease in the district had not been adequately investigated. Notwithstanding that the incidence of smallpox in Oldham occurred with the graduation which Mr. Power found to attach to aërial dissemination, I regarded the accusation as not proved.

The Chadderton Local Authority appealed to the Local Government Board, who accepted the view which had been taken in Oldham. Personally, however, I was left with the feeling that Dr. Patterson might be right.

In 1893, with favouring winds, a sweep of smallpox occurred in Oldham in a direction almost at right angles to that formerly observed in Chadderton. Careful investigation appeared to prove that this outburst could not be shown to depend on case-to-case infection, and

I arrived at the conclusion that the occurrence was of the nature of aërial diffusion.

Now Mr. Power's investigations appeared to show that aërial diffusion only takes place when there are a number of acute cases treated in hospital, and I therefore advised the Oldham Authority to fit up a building on the Pennine Hills, remote from houses, and transfer to this all their acute cases, reserving Westhulme Hospital for convalescent cases. This was accordingly done. The result was that in his Annual Report on the health of Oldham, my successor, Dr. C. H. Tattersall, was able to report that not a single case had occurred in the neighbouring district of Chadderton during 1894.

Now, this striking change by no means constituted proof by itself, and apart from the individual investigation of cases, that the diffusion of smallpox in Oldham in the region facing the hospital was by aërial transmission, although it justified the action taken on other grounds. What it did prove conclusively was the desirability of removing a smallpox hospital from the neighbourhood of houses, failing other means for preventing the conveyance of infection from the hospital. It has been concluded from the fact that in other instances of apparent aërial diffusion, omissions to secure isolation or to prevent the personal conveyance of infection by the staff justifies the rejection of Mr. Power's view. But, surely, that is not so. It would not have been logical to assert that there was no aërial transmission into Chadderton in 1888 because much oversight and direct transmission were observed.

Infection might have been introduced, for example, by members of the staff visiting shops in Chadderton Road near the district, and infecting the shopkeepers or visitors. Or it might have been conveyed by ambulances halting near the hospital. This possibility was afterwards carefully considered for Manchester. But no evidence could be obtained of smallpox being conveyed from ambulances in transit. It is, however, a different matter when we consider the possibility of ambulances halting near the hospital.

It remains, however, that no diffusion at all took place, although convalescent patients were treated at Westhulme in 1894. We must infer, then, that hospital diffusion does not occur by personal infection from persons in contact with smallpox convalescent patients—a very doubtful proposition—although convalescents are certainly very slightly infectious, or that the process is such as Mr. Power believed it to be. In either case, a strong case had been made out for removing smallpox cases from the neighbourhood of houses.

When I came to Manchester in 1894, smallpox patients were treated in wooden pavilions erected in 1893 on ground not physically separated in any way from the rest of the fever blocks. These belonged to the

Corporation, but were administered by the Royal Infirmary. No communication of any sort was believed to occur between the smallpox pavilions and the rest of the fever wards, the smallpox side being complete in all departments. The only personal communication was believed to be through the Medical Superintendent and the Matron. No vaccination of the other patients had been carried out. It was certainly a dangerous position. Yet prior to May, 1894, I was assured by Dr. R. W. Marsden, the Medical Superintendent, that only two or three cases had occurred, at odd times, among the fever patients.

In May, 1894, a remarkable sweep of smallpox occurred round the Monsall Hospital, extending from the northern side right round to the west and south west. At the same time five cases of smallpox occurred dotted about in different fever wards. Monsall Hospital is separated from Harpurhey and adjoining parts of St. George's and Newton by a valley and a huge tip, so that no direct access existed between the hospital and the houses affected. The staff usually went into Manchester by way of Monsall Road and Oldham Road, a route avoiding the parts chiefly affected. No evidence was obtained implicating the staff of the hospital, and part of the area affected was quite out of the ordinary routes. I cannot say that the cases were all investigated personally, or that the same energy of investigation was exerted as was the case at Oldham in 1888. But the distribution of the cases, the absence of evidence of personal infection in the inspectors' reports, and the simultaneous occurrence of cases dotted about in the hospital were practically conclusive as regards the route of infection. The direction of variable winds a fortnight before this outbreak was compatible with the diffusion observed.

Now, in 1893 Dr. Tatham had treated acute cases in the Monsall Hospital buildings, and convalescent patients in an old shed on the Medlock in Clayton Vale with a good house attached. The position of those buildings was fairly remote from houses, and I therefore advised the Sanitary Committee to adapt an additional shed for acute cases of smallpox and reverse the previous arrangement, acute cases being removed to Clayton Vale. This was rapidly carried out, with the assistance of the Cleansing Department, and the disease quickly subsided in Newton Heath and Harpurhey. No cases occurred in these districts in 1895 out of a total of 51. On this occasion, however, I introduced a new procedure. New cases, whether severe or slight, were inuncted every day with a 5 per cent carbolic oil until convalescence was well established. The idea was to keep down infection. But it had also the effect of greatly relieving symptoms. On a subsequent occasion, reason occurred for believing that this is an effectual method of subduing aerial conveyance. A gang of workers were put on in connection with the laying of a new sewer passing close to the wards, a number of whom

refused to be vaccinated. Notwithstanding exposure at close quarters, none of them contracted the disease.

This mode of procedure was varied by the substitution of dressings with lint wrung out of solution of boracic acid in severe cases of confluent smallpox with extensive excoriation, which, of course, answered the same purpose. There can, I think, be little or no doubt that smallpox infection is discharged principally from the skin, and more particularly in the early stage of the disease, and that its dissemination can be controlled in hospital. I should not hesitate, now, with a reliable staff, to treat smallpox in an ordinary fever hospital, suitably prepared by disinfection, should pressure occur. At the same time, patients suffering from other diseases would need to be removed.

In considering what happened round Monsall Hospital in 1894, it is necessary to observe that in 1892, when 118 known cases occurred, the incidence was highest in St. George's and Newton districts, though none occurred in Moston or Harpurhey. In 1893, when 607 known cases occurred, the incidence rate was highest in Moston, St. George's, and Newton, all of which districts surround the hospital. In that year Harpurhey came seventh of the 18 districts. There had, therefore, been considerable incidence on all the districts affected by the diffusion in 1894, both in 1892 and 1893. The highest incidence rates in 1894 were in Newton, Harpurhey, and St. George's. The Moston rate was low in 1894. It is quite manifest, then, that the hospital influence, whatever its nature, was evident in the affected districts in 1892 and 1893, as well as in 1894. This influence might quite well have been staff infection in 1892 and 1893, though it may also have been aerial diffusion, and, in the case of Moston in 1893, most probably was. What stamped the diffusion in 1894 as aerial was the peculiar distribution of cases round the hospital, and the simultaneous dotting of cases about the fever wards. At the same time, I am far from inferring that the influence of the hospital is confined to occasional aerial diffusions, and it would be a serious error to confine one's preventive measures as regards smallpox hospitals, wherever situated, to the prevention of aerial diffusion.

In 1894 I provided the Sanitary Inspectors with directions for investigating and dealing with cases of smallpox.

The next outbreak, which occurred in 1902-04, may be said to have begun in 1902, though odd cases occurred in 1899, 1900, and 1901, and a sprinkling went on to 1907. In this outbreak I had the assistance of Dr. James Cowie and Dr. Duncan Forbes. The cases were all treated in Clayton Vale Hospital entirely. It is therefore of interest to see what happened in that district which was the nearest to the hospital.

No cases occurred in the district of Clayton in 1894, though 122 were treated entirely in the hospital, nor yet in 1895, although an easy exit of the staff into Manchester was through Clayton district. In 1903 only

two cases out of 422 occurred in that district. In 1904, however, seven cases occurred, and, although no case was traced to the hospital, this number, small as it is, causes the incidence rate to be higher in Clayton than in any other sanitary district. The incidence rates on Newton, Harpurhey, and Moston were then low, particularly the last two.

I am satisfied that no aërial diffusion occurred from Clayton Vale Hospital in 1903 and 1904. But I am not satisfied that contact infection did not occur, although it could only have been slight. At the same time I endeavoured to secure that the staff on leaving the hospital took all possible precautions, such as bathing and going out in clothes not worn inside the hospital. It is easier, however, to control aërial than personal infection.

Smallpox is generally the easiest of diseases to control if diagnosed as soon as it occurs. All that is necessary is to isolate the patient and surround him with a cordon of vaccinated contacts. The cordon is necessary, but the patient is better isolated in hospital. The rule adopted is that any person successfully vaccinated within three days of his first exposure to smallpox infection is protected. This rule almost never fails, and if it does the subsequent attack is not severe.

This cordon may be a huge one if the case occurs in a large workshop or factory, but of course the managers give all assistance possible. I found it best, if the case was diagnosed early enough, to trust to the Public Vaccinator, although this involved much clerical work in communicating at once with public vaccinators in the City and medical officers of health of other districts. But there may not be time for this, and then the Medical Officer of Health and his staff must carry out the vaccination. It is not permissible to leave vaccination unperformed or to be performed at leisure. Immediate steps must be taken to set every available agency to work, so as to secure as many vaccinations and revaccinations as possible, and the Medical Officer of Health must use his personal influence as well. One must not omit to ensure that every member of the ambulance and disinfection services, and of the nursing staffs, as well as every person employed about the smallpox hospital, is newly protected by vaccination when smallpox breaks out. This should also apply to other hospitals in the service of the Corporation. It is justly regarded as discreditable if a member of any of these staffs contracts smallpox, although one foolish person did escape vaccination and promptly contracted the disease.

Vaccination is now a safe operation if properly performed.

I have always found the tracing of smallpox contacts and origins interesting, but not easy. Special officers are needed for this work, with great keenness and energy, although quite often the medical staff must themselves assist. Mr. John Hewitt, Mr. Isaac Priestley, and my three special inspectors are particularly good, though there are some others

available. Special men should be told off for investigating infectious disease, carefully trained, and properly remunerated. Many errors will otherwise occur. In 1903 and 1904 more than one-third of the total cases had been overlooked, and it is overlooked cases that spread infection.

In 1903 smallpox invaded the common lodging houses, and the disease threatened to spread severely. I therefore visited the suspected common lodging houses by night and examined the foreheads of the inmates by means of a lamp. I was, of course, accompanied by a constable, the common lodging houses being under the police. Having assured myself that smallpox could be detected in this manner, I took Inspector Priestley with me, and finally the systematic examination of the inmates in this manner was handed over to him and three other inspectors. The procedure depends on the preference of the smallpox eruption for the forehead. In this way 32 cases were detected. We also considered how these common lodging houses could be made safe, and clearly the first step was to vaccinate the inmates. The whole staff took part, and by the bribe of a shilling the vaccination got carried out. It was, however, necessary to prevent the lodgers scattering when smallpox made its appearance, and this was got over by guaranteeing the maintenance of all who remained for a fortnight in the lodging house. By these means the disease was expelled from the common lodging houses. But it was not a light undertaking for the staff.

These, I think, were the principal new features imported into the treatment of these outbreaks. But the essential thing is to meet every occurrence as it comes with energy and at once, sparing no trouble, either in the medical staff, inspectors, or nurses. For any oversight one pays in failure, and everyone should be his own severest critic. An account of these outbreaks in Manchester is implicitly contained in the Inspectors' Case Sheets and the Registers, and an explicit statement was given by Dr. Cowie in the Annual Report, 1903, and by Dr. Forbes in the Annual Report, 1904.

In more recent years the investigation and treatment of smallpox have been carried out by Dr. McClure and Dr. Young, energetically and successfully.

A smallpox hospital is needed as already mentioned.

MEASLES.

For many years this disease was the despair of public health, the death rate being very excessive during the 20 years 1881-1900. In the 15 years 1901-15 it was somewhat lower, particularly after 1911, in which year by a Local Act measles and whooping cough were made notifiable to head teachers, the idea being that these notifications should be transmitted to the Medical Officer of Health through the School

Medical Officer. As a matter of fact, they were so transmitted, but so much time was lost that their value was greatly diminished. It is doubtful whether they made much difference to the previous arrangements made between the Public Health and the Education Departments.

In December, 1915, cases of measles and German measles were made notifiable by medical practitioners by order of the Local Government Board, though only the first case occurring in a house. The administration of this Order was handed over to the Health Visitors, who were required to fill in a form and advise mothers as to food, isolation, and general management of the children. The death rate in the five years 1916-20 fell from 0.50 to 0.24, and last year (1921) there were only five deaths in the City.

Some assistance in nourishment and coal was given in suitable cases—a most useful aid in securing preventive measures. There can be no doubt that in Manchester this Notification Order, properly administered, has been an unmixed good. I am strongly of opinion that this disease can only be dealt with properly at home. If the fever hospital is regarded simply as a means of preventing either the incidence or severity of disease, it is of no use in measles.

If it be regarded as a means of relieving a few families in bad cases, it may to some extent fulfil its purpose. But it is doubtful whether even as an institution for treatment it is to any large extent justifiable. Still, I am of opinion that some provision should be made at as great a distance as possible from the other wards, were it only to relieve parents, in special cases, of the charge of very severe cases, and to give an opportunity for the study of the disease and of its treatment.

But the real work has been done in Manchester by the health visitors, and most admirable work it has been. The only drawback to it is that it withdraws the staff for long periods from their proper work of instruction of mothers in the general management and care of children, and limits them too narrowly.

The proper remedy is to increase the staff sufficiently to cope with both duties. I may say that the staff have received special instruction as to the manner in which their duties in respect of measles should be carried out.

Measles is peculiarly a disease of poverty, that is, in so far as the death rate is concerned, and you might almost chalk out the gradations of the districts as regards poverty by adding up the death rates from measles for a number of years. It is, therefore, peculiarly a disease on which well-trained health visitors may be expected, under suitable medical guidance, to produce an effect, especially if the grants in aid hitherto allowed are continued.

WHOOPIING COUGH.

The same observations apply to whooping cough. Here, however, the fall occurs after 1911, so that the school notifications may in this case have been of more value. But the agency of improvement has been the same. The death rate from whooping cough in the last 10 years is less than one-half of what it was prior to 1900.

It would, I believe, be well worth while to make first cases of whooping cough notifiable by practitioners, leaving the actual administration, as now, in the hands of Dr. Drummond, under the guidance of the Medical Officer of Health.

Further, in making provision for a limited number of cases of measles and whooping cough, for purposes of study, it would be desirable that the pavilions intended for these diseases should be so constructed that they should have the advantage of open-air treatment to the greatest practicable extent. This is the more desirable inasmuch as the cases to be treated would often be suffering from broncho-pneumonia of a septic character.

ERYSIPELAS.

Although a small block had been provided for cases of this disease in Monsall Hospital, I have not made an intensive study of the disease. It is stated, however, to be most prevalent from October to January. The annual number of cases notified corresponds in its rise and fall, though not with absolute closeness, to that of scarlet fever. There is an even closer correspondence with the number of cases of puerperal fever notified. There are in the registers and case sheets available materials for a study, though not a very intimate one, of the course followed by this disease, and it is desirable that it should receive more attention in connection with sepsis generally.

CEREBRO-SPINAL FEVER.

Cerebro-spinal fever became compulsorily notifiable in 1912. This formidable disease has never become prevalent in Manchester, though isolated cases have occurred widely scattered over the City. Most of the cases have been removed to Monsall Hospital. The mortality has been extremely high, a fact determined partly by the comparatively low ages of those attacked. The mortality compares unfavourably with that obtained in Belfast and Edinburgh, especially in recent years, and it appears possible that a reduction could be secured by a further study of serum treatment and early removal to the hospital. So far as we know at present, the disease is largely spread by carriers, that is to say, persons not themselves suffering but harbouring the diplococcus in their naso-

pharynx. Harbourers of the meningococcus multiply when a number of persons are thickly packed together, one of whom is, or has been, suffering, or is a carrier. This happens especially in barracks. It has been the custom here to send contacts for examination to the bacteriological laboratory. But, except on one occasion, when five contacts were found to harbour the meningo-coccus, the examination of contacts has given persistently negative results. The disease is most prevalent in the early months of the year. The onset is usually sudden and severe. A probable diagnosis can often be made. But a reliable diagnosis depends on microscopic examination of fluid obtained from the cerebro-spinal column.

In children, and to a less extent in adults, it may be impossible to distinguish clinically between cases of cerebro-spinal meningitis and cases of meningitis due to the pneumococcus or to septic organisms, and bacteriological work is therefore necessary for all cases of meningitis.

It is assumed that the disease is spread by carriers, and there are few instances of direct infection.

No other means of transmission has been ascertained.

It may be assumed that for the spread of infection, overcrowding and favouring conditions producing physical depression, possibly with post-nasal catarrh, are required. No better course suggests itself, meanwhile, than the systematic examination and isolation of contacts.

Much research work has been done on this disease.

The analogies between pneumococcal and meningococcal infection are striking.

POLIOMYELITIS.

This disease, formerly known as infantile paralysis, like cerebro-spinal fever, appears usually to begin abruptly. But, if enquiry be made, it is usually found that the sudden onset of paralysis has been preceded by an attack of fever. Much of our knowledge of it comes from America, where a widespread outbreak in New York, in 1907-08, received a very full and well-documented study. Flexner has demonstrated that it is caused by an ultra-microscopic micro-organism, which can pass through filters, and that it can be communicated to monkeys by inoculation of the brain. From the nervous system it passes to and lodges in the nasopharynx.

Its chief influence is exerted on the grey matter of the brain and spinal cord, in which it causes minute hæmorrhages, with small-celled infiltration round the capillaries, leading frequently to atrophy of the grey substance. The paralysis which it causes may pass off or remain permanent. But, although it affects chiefly children, and attacks more especially the motor centres, it assumes multifarious forms, and is

liable to invade many centres, and even to produce meningitis and a condition simulating cerebro-spinal meningitis. On the other hand, according to Draper, it often manifests itself in contacts by a short fever, without any distinct effect due to injury of the nervous system. In the view of the New York authorities, it is communicable from one person to another.

Our enquiries into individual cases have revealed nothing of this activity of spread, and it may be that some change of type is necessary before the infecting agent shows its full power of diffusion.

Like cerebro-spinal fever, the cases are widely dispersed, though the total number of cases is small in this district. In one respect, however, all the different accounts agree, viz., that the number of cases increases late in the autumn—from October onwards. At one time it was suggested that the disease was propagated by means of a biting fly, but this suggestion appears to have been dropped.

The total number of cases in Manchester is too small on which to found any general administrative action of a preventive character. Multiple cases sometimes occur in one home, and it is stated that the infection lodges in the nasopharynx, is conveyed in clothes, and remains viable in dust; also that it is conveyed by carriers. Recent cases should, therefore, be kept isolated from as many of the household as possible, the sick-room should be kept clean and free from dust, and used handkerchiefs should be placed in a disinfectant.

ENCEPHALITIS LETHARGICA.

Encephalitis lethargica is a dangerous febrile disease characterised, in many cases, by a peculiar impassiveness of face and mind, usually without loss of consciousness, and by paralysis or paresis indicating invasions of the third, sixth, and seventh nerve roots, also of the higher nerve centres. Pathologically, various collections of grey matter, more especially in the region of the bulb, show changes similar to those exhibited in the anterior cornua in acute anterior poliomyelitis.

The subject has been investigated by the Ministry of Health, and clinical as well as pathological data have been published. Dr. McClure has given an account of the cases which he has visited in Manchester, and has shown that, even when the patient recovers from the immediate attack, he is liable to remain enfeebled. The cases occurring in Manchester have been sporadic, and no epidemiological data of value are available. It has been suggested that the cases represent a variant of poliomyelitis, but the Ministry of Health do not accept this view, and clinically, at least, they represent a very distinct type.

The disease became compulsorily notifiable in January, 1919.

MALARIA, DYSENTERY, AND TRENCH FEVER.

By the Public Health (Pneumonia, Malaria, Dysentery, etc.) Regulations, 1919, the above diseases were made compulsorily notifiable in March of that year. Paratyphoid fevers are, by these, included under the term typhoid fever. The notification of pneumonia is confined to cases of primary and of influenzal pneumonias. Power is given to exclude from employment connected with the preparation or handling of food or drink for human consumption, persons suffering from dysentery or from typhoid fever, as well as carriers of these diseases. This provision applies also to carriers of enteric fever.

The duties of the Medical Officer of Health in respect of the above notifications are set out in the regulations, and involve a considerable amount of supervision. Most of the cases of malaria, dysentery, and trench fever are ex-service men, and the Ministry of Pensions has established in Manchester a clinic and a hospital at which they receive treatment when required. Mostly, however, they are treated at home. All of them are liable to relapses. Malaria and dysentery appear to be dwindling. In the presence of trench fever, the Medical Officer of Health may take measures to secure delousing of other persons inhabiting the same building.

Dr. W. A. Young, D.S.O., who has had the administration of these diseases, has given a statement on them for each of the last three years, and reports the number of notifications as follows:—

	1919.	1920.	1921.
Malaria	312	172	38
Dysentery and carriers....	27	14	8
Trench fever	1	1	1

In no instance had any contact acquired the respective disease.

NOTIFICATIONS OF PRIMARY PNEUMONIA AND INFLUENZAL PNEUMONIA.

These conditions have only been notifiable since March, 1919. At first, notifications came in very scantily, but in 1921 they were much more numerous. Many practitioners had evidently not realised that primary lobular pneumonia, not evidently depending on any other condition, is notifiable. These notifications are very valuable as giving an opportunity to institute etiological enquiries. But, in 1921, there was a singular fact about the notifications for lobar pneumonia. These began abruptly to be more numerous in June, and continued for the rest

of the year, sharply increasing in December. When the detailed tables are examined, this rise is seen to affect the districts generally, and it is also seen that in some it had begun even earlier. This is the reverse of the ordinary seasonal behaviour of pneumonia, and it may mean either the rise of some disease favouring pneumonia, or an infectious character imported into lobar pneumonia itself. In this case it meant, probably, the onset of the influenza wave which came later, and which was then to some extent simulated by scarlet fever. Curiously enough, it is in lobar pneumonia rather than in influenzal pneumonia that the influenza wave is reflected. The facts also show that this lobar pneumonia was unusually infectious.

The notifications of pneumonia, if regularly tabulated in weeks, are therefore capable of giving valuable intimations. No doubt their significance would have been much more evident had bronchitis also been notifiable, or even had bronchitis deaths been taken out in weeks.

The public assistance given in cases of pneumonia during the influenza outbreaks of 1918 and 1919 was valuable but inadequate, and might be increased in a period of distress such as now prevails. The Order of 1919 gives express power to provide such assistance, which will include medical assistance, nurses, nourishments, and hospital provision.

EPIDEMIC INFLUENZA, 1918-1919.

Three severe outbursts of influenza occurred in the course of this pandemic. In Manchester the first lasted six weeks, and was much less fatal than the other two. It began in the 25th week of the year 1918 and came to an end in the 32nd. The number of deaths was 177 males, 155 females. The second outbreak began in the 42nd week of 1918 and extended to the fourth week in 1919. The distress which it caused, and the mortality were most formidable. At one time there was difficulty in getting the dead buried. The number of deaths during this outburst was 702 males and 1,013 females. Another outbreak followed, beginning on the 5th week of 1919, and extending to the 17th week. There died in this third outbreak 444 males and 492 females. The total number of deaths attributed directly to influenza, during the three outbreaks, was, therefore, 2,981. The total number of deaths for the whole two years, ascribed directly to influenza, was 3,143.

The last previous pandemic occurred in 1889 to 1892, and like the present one contained three outbreaks, which in point of fatality and duration bore much the same relation to each other as the three outbreaks just mentioned.

It was of practical moment at that time to know whether one attack protects against a second, and various observers studied the subject.

Although, as in 1918, the second outbreak was much more severe than the first, the information which one was then able to collect appeared to indicate that in a large number of cases, protection was afforded by a first attack against a second in a subsequent outbreak. This point was determined for 1918 and 1919 at several centres by Medical Inspectors of the Ministry of Health, by means of a census applied to a definite area, showing the number of persons attacked in that area, the history of the attacks sustained, and the fatality in different outbursts. Dr. Thomas Carnwath carried out the investigation in Manchester, and Miss Seed found for him investigators.

The results of the Manchester investigation could only be interpreted as showing that one epidemic outbreak gave no protection against the next.

One was very reluctant to accept this conclusion without qualification, unless we must also conclude that the essential characters of the three outbursts were quite distinct, in fact, that the cases belong essentially to three different diseases, the extent to which this was the case varying in different localities.

During 1889 to 1892 I was in Oldham, and a very brief account of these outbreaks is given in the Oldham Reports for 1890 and 1891. Except that the work of mitigation of hardship was less attended to than was the case in Manchester in 1919, the measures of precaution seem to have been much the same, and the experiences as regards the resemblance of influenza to scarlet fever were very much alike in Oldham in 1891 and in Manchester in 1921.

It should be said that the third outbreak in the previous pandemic, which occurred early in 1892, did not attack Oldham. But in many places the course of events was much like that recently experienced.

The difficulty in distinguishing between scarlet fever and influenza in 1891 was not due to lack of knowledge, as in 1881 I had made an intensive clinical study of scarlet fever, while in the service of the Metropolitan Asylums Board.

An excellent account of the pandemic of 1918-1919 is given by the publication of the Ministry of Health on influenza in 1920, and the pandemic of 1889-1892 is described by Dr. Parsons in two reports published by the Local Government Board in 1891 and 1893. The two accounts may be usefully compared.

In Manchester in 1919, the staff of the Health Visitors' section of Child Welfare distinguished themselves greatly by the manner in which they volunteered to nurse the sick, and to care for the families overwhelmed by influenza ; and Miss Seed by the energy displayed in seeing that the worst cases received coal, or food, or nursing help, under the sanction of the Public Health Committee. As in Oldham, so in

Manchester, the same advice was widely distributed, that those attacked should at once seek rest and medical advice, and not return to work within three weeks of an attack. Advice is also needed on how to avoid exposure to infection, but we are not yet able to promise either prevention or cure, and there can be no doubt about the supreme importance of at once seeking rest, isolation and medical care; also, of not returning to work within three weeks from the onset of an attack, even after a mild attack. A brief account of the recent Manchester experience is given in the Annual Reports for 1918 and 1919, and more fully in the Ministry's publication, already mentioned. It is difficult to summarise the great mass of research and information which this book contains, and probably the lessons to be derived from it would be very differently emphasised by different persons. These points, however, stand out clear.

1. In presence of an outbreak of influenza, too much pains cannot be taken in making it clear to the entire population, and especially in workshops and schools, that, immediately on the occurrence of an attack, the sufferer should be isolated and receive medical advice and treatment.

2. Such treatment should include absolute rest, the patient not being allowed to get up until completely recovered.

3. Patients should not be allowed to return to work for a period of three weeks, or longer, if the attack has been severe.

4. The whole resources of the community should be mobilised to secure adequate nursing and domestic help, when these are needed.

5. Good nourishment, sufficient fuel, good ventilation, and adequate assistance by way of nursing and other attention are vital.

6. It is more than doubtful whether cases of pneumonia or broncho-pneumonia should be removed to a hospital, unless there are other reasons than the interests of a particular person involved.

7. Too much trouble cannot be taken to prevent infection by personal contact or contaminated materials, especially in the earlier days of an outbreak. For that purpose, the probable points of danger should be classified and made known.

It is possible that means may be found to improve the preventive and curative procedures so far advised, but the condition known as influenza is very complicated. It would seem as if "influenza" has a powerful though variable effect in stimulating the organisms shown by Cobbett to be normally present in the lungs, and the history of the two last pandemics would even suggest that one stimulus is not able to take effect until another has been operated. There can, in any case, be

no doubt that, with sufficient organisation, much may be done to reduce the fatality of an epidemic.

THE SCHEME FOR VENEREAL DISEASES.

The essential features of this scheme are adumbrated in the Report of the Venereal Diseases Commission, 1916, and were involved in the Public Health (Venereal Diseases) Regulations of July 12th, 1916.

By this Order, counties and county boroughs were required to provide schemes for treatment, 75 per cent of the cost to be defrayed by Government. The objects of the scheme, as outlined by the Local Government Board, are thus stated in my Annual Report for 1917: "Local authorities are to draw up schemes of treatment to be readily available to the whole community. Institutional treatment is to be, as far as possible, in general hospitals. The treatment at institutions is to be free to all, from whatever area coming. Evening clinics are to be established for the benefit of the working classes. Local authorities are to supply salvarsan or its substitutes gratuitously to medical practitioners under proper safeguard. Medical men treating cases of venereal disease are to hand printed instructions to any person suffering from venereal disease applying for treatment. Medical students and practitioners are to have free access to venereal diseases clinics for purposes of instruction. Extended facilities are to be given for the diagnosis of venereal diseases at public laboratories. The fullest use is to be made of university and hospital laboratories. Accurate statistics are to be kept of all work done. Provision for treatment is to be made in prisons and Poor Law hospitals. A special practical course in venereal disease is to be given to medical students, and questions on the subject are to be set in examination papers." It may be added that treatment was to be private, and the greatest consideration was to be shown to these cases—a most necessary condition.

Little is said about the prevention of venereal diseases, except in so far as this is relegated to the local branch of the National Association for Combating Venereal Diseases, which was to be formed. The Venereal Diseases Act, 1917, requires that all advertisement of remedies for venereal diseases is prohibited, and prohibits also the treatment of venereal diseases by unqualified persons. This clause, however, has to be made applicable to particular areas by Order.

The Order of the Local Government Board was accompanied by an explanatory circular and memorandum.

These set forth in full detail the part to be fulfilled by the clinics, the arrangements to be followed in the daily routine, the provision to be made of hospital beds and of beds elsewhere, the qualifications of the medical officer of the clinic, the relation of the general practitioner to

the scheme, the work of the Medical Officer of Health, the conditions applying to the gratuitous supply of salvarsan and its substitutes, and the arrangements for the examination of pathological material.

To the local Medical Officer of Health was left the provision of a scheme and responsibility for its success. He was not expected to engage personally in treatment, and no authority was given to him in respect of the scheme once started.

A scheme was drawn up and submitted to the Council in April, 1917, which provided for the establishment of venereal disease clinics at the Royal Infirmary, the Ancoats Hospital, the Hospital for Skin Diseases, and the Lock Hospital. It was accepted by the Council and the Local Government Board.

Great difficulties were experienced in arriving at agreements, the lay Boards of the hospitals—and not they alone—entertaining strong objections to the proposals. It was very difficult, even in some measure, to carry out the requirements of the Local Government Board, that clinics should not be specially designated as for venereal disease, and that nothing is to be done to distinguish the patients who attend for treatment. Whether this is or is not practicable at public institutions, it was not completely carried out. It may be confidently asserted that this almost entirely cuts off from public treatment a large section of those suffering, especially that class which might be expected to carry treatment through. This does not apply so much to patients coming from a distance.

Great pains were expended by Professor Delépine in devising suitable arrangements for taking and examining pathological material. However, at an early period he handed over the examination of venereal disease material to Professor Dean, whose work in connection with the deviation of complement is well known. The scheme was well advertised. All the earlier arrangements were made by me in 1917 and 1918, after which the scheme was put in charge of Dr. W. A. Young, D.S.O., whose admirable statements are contained in my Annual Reports for 1918-21.

Amongst the defects perceived from the first was the absence of proper douching arrangements at more than one hospital, defects which have never been remedied, notwithstanding the representations made to the authorities.

The proposals originally made were too large in scope, and it would have been far better to start on a smaller scale. But the circumstances in Manchester were such as to make it difficult to exclude any of the institutions mentioned.

Still this would have left it open to change the whole scheme if it should prove inadequate in working.

The advantages of a scheme of treatment of the magnitude put forward was that it interested in the new treatment of venereal disease most of the hospital physicians and surgeons, who had already had experience, and disarmed the opposition of the general hospitals.

The success of such a scheme is dependent on the punctuality and regularity of the medical officers in attendance, and it is probable that these characteristics would be more uniformly exhibited in officers specially devoted to venereal disease, whose living depended on the manner in which their work was carried out. Probably, also, it would be better if the venereal diseases treatment scheme was directly under the Corporation, who would see that such requisites as douche rooms, and access to these at all times, would be provided.

Apart altogether from the division of classes created by the failure to secure entire privacy, the benefits of treatment are largely lost by the failure of patients to continue under treatment until cured. Dr. Young has pointed out that in a high proportion of cases of syphilis the patients abandon treatment before they are cured, and that such is the case in over one-half of the cases of gonorrhœa. I do not mention this as any reflection on the existing scheme, since it might quite well apply to any other scheme—at all events, to a large extent. But what it does show is that, in the limited class of patients treated under the Manchester scheme, treatment fails, in a high proportion of cases, to secure any benefit, whether of treatment or prevention. However, the existing clinics have raised the whole level of treatment. Whether the level would not have been still higher under a self-contained scheme—with attached laboratory, all necessary accessories, and a whole-time staff—may be questioned. But even should it prove necessary to change the present scheme, valuable experience will have been gained. In 1919, St. Mary's Hospital came into the scheme. The arrangements have steadily improved under Dr. Young's skilful guidance, and the large amount of work involved may be gathered from his reports. The number of patients and the amount of treatment have steadily increased up to 1921, in which year there was a fall in the number of new cases. Probably this was to be expected as the wave of lawlessness fell back.

What, however, may be doubted is whether all this treatment has great preventive value, although it may be granted that it is no small matter to establish the conditions necessary for successful cure. In fact, it is doubtful whether gonorrhœa has at all diminished under the present regime of timid morals and insufficient douches.

In 1920 two of the maternity and child welfare centres were added to the scheme of treatment, and, though the numbers treated have been small, these have been distinguished for regularity of attendance, and also for the proof which they have given that syphilitic pregnant women properly treated, will produce healthy offspring.

A scheme for the treatment of pregnant syphilitic women in connection with St. Mary's Hospital was not confirmed by the Ministry of Health on the ground of expense.

In 1920 an auxiliary centre for intermediate treatment was opened at Monsall Hospital, and has done excellent work. It was equipped and has been administered by Dr. Young. It is on all hands agreed that intermediate treatment is necessary for the successful treatment of gonorrhœa. Such a centre exists at St. Luke's Hospital for St. Luke's patients, but is much needed for male patients treated elsewhere.

One of the defects of the scheme is its failure to attract women suffering from gonorrhœa. Greatly increased attention is needed by gynæcologists and practitioners to the treatment of abnormal discharges in women.

In other infectious diseases, hospital treatment is the handmaid of preventive measures. When these new schemes were launched, we were to take venereal diseases out of the region of moral stigma, and place them in the domain of preventive infectious diseases. This change of spirit is still conspicuous by its absence.

EARLY TREATMENT CENTRES.

In December, 1919, a centre was opened at the Great Bridgewater Street lavatories for the disinfection, under skilled supervision, of men recently exposed to infection, and in September, 1920, another was opened at Victoria Street. The attendances were numerous, and it was shown that these centres were the means of detecting the need and of securing early treatment at a clinical centre for a large number of men actually suffering from venereal disease. No proof was ever obtainable that any man so disinfected had contracted the disease to which he had been exposed, and there was some evidence to the contrary. This was, in effect, a real effort to prevent disease, and the arrangements were skilfully planned and supervised by Dr. Young. But the cry of morals in danger was too insistent, and in 1922 the City Council gave an instruction for the centres to be discontinued. It must, of course, be admitted that, valuable as the work done at these centres was, it was limited to a certain class of the community, but this must always be the case, and their great value lay in the proof that the contracting and communication of venereal diseases was unnecessary and immoral.

Needless to say, the cry of morals in danger was still more loudly raised against the proposal to instruct men generally in the methods by which they could protect themselves after sexual intercourse. It was, amongst other things, pointed out that these procedures would fail to be carried out, or would fail of their effect if the man were intoxicated. This is not a real difficulty. The number of intoxicated men who came to the early treatment centres was trifling.

A more real danger was that the procedures advised might be inadequate. But that would rectify itself in time, and I, personally, consider that if the means exist whereby a man can protect himself, and which he can carry out without any excessive effort of intelligence, the knowledge should be made available to him with all proper safeguards.

We should, in fact, deal with these diseases as in the same category with diphtheria or enteric fever.

Baffled in this direction for the moment, those who are determined that venereal diseases shall be admitted into the category of preventable maladies are now agitating for their compulsory notification. This is certainly in the right direction, but will most likely be surrounded with all sorts of useless conditions. A notification is confidential, and must be treated as such, unless circumstances arise which make it necessary to take further action, and this safeguard should suffice. It is proposed to use notification as a means to compel the person concerned to continue under treatment until cured. I do not think that this is practicable.

As soon as compulsory notification is so used the number of persons applying for public treatment will rapidly fall off, and the whole level of treatment will fall with it. If, on the other hand, compulsory notification can be utilised to investigate the circumstances under which disease has been acquired, and to give advice and assistance, much good may be achieved. But compulsory notification is no substitute for preventive treatment. Still, it is a useful measure to adopt, properly handled, and without any policing attached to it.

THE GENERAL PRACTITIONER.

The general practitioner is at present at a serious disadvantage. He cannot, in general, supply the necessary skilled treatment, and he cannot advise his patients to go to a clinic. Neither can he find time to acquire the necessary skill. Many persons cannot afford consulting fees. Until practitioners generally have been brought up to practise the newer methods, which will take some time, it may be worth considering whether it might not be possible to provide trained men with consulting rooms, employed by the Corporation for part of their time, to give the necessary treatment to patients referred to them by practitioners. At all events, some bridge is required. Moreover, practitioners require some such support in advising their patients in those cases which will certainly require prolonged treatment.

The details of the work done under the venereal diseases scheme are fully set forth in the Annual Reports of the Medical Officer of Health.

TUBERCULOSIS.

It will not be possible to discuss at great length this vast subject. Tuberculosis is a disease which carries off about one-tenth of the race, or perhaps more, if one takes into account its indirect as well as its direct effects. Its onset is caused by numerous other diseases, such as injuries, catarrhs in the mouth and nose, bronchitis, pneumonia, typhoid fever, measles, catarrhal affection of the bowels, and many others.

It is predisposed to by any weakening or exhausting conditions, such as inherited feebleness, weak action of the heart, exhaustion from work too severe or too prolonged for the individual, prolonged engagement in a sedentary employment which depresses the respiratory activity, exposure to irritating dust, and so forth.

Alcoholics, for some reason or another, suffer very severely, probably owing chiefly to the catarrhs and injuries of the larynx and bronchi to which they are liable. But all exhausting dissipation predisposes to the disease.

Children also suffer severely, especially those who are of weakly constitution.

It is thus not a matter for extreme surprise that tuberculosis continues to cause from one-seventh to one-tenth of the deaths from all causes, since almost every derangement which lays the human frame open to disease and death also exposes it to the risk of tuberculosis.

In some southern countries tuberculosis acted like a veritable plague, so much so that, in the middle of the eighteenth century, persons attacked were treated as though suffering from a dangerous infectious disease, and the severest measures of isolation and disinfection were taken in Italy, Spain, and France. Laws were passed in Italy and Spain enforcing stringent precautions, and, according to Heron, phthisis was popularly regarded as infectious in the Highlands of Scotland.

It was, however, reserved for a French physician, Villemin, in 1865, to bring together the various facts indicating that the disease was communicable, and by producing the disease in rabbits and guineapigs by the inoculation of tuberculosis matter to give experimental proof of his views. He was able to show that it could be conveyed in series from one animal to another.

A French veterinary surgeon, Chauveau, demonstrated that the disease was conveyed to bovines by the ingestion of tuberculous material.

Finally, Cohnheim and Salomonsen, by inserting a small speck of tuberculous material into the aqueous chamber of the eye of a rabbit, were able to follow the growth of infection and its final penetration into the system.

Theoretical doubts still remained, till in 1882 Dr. Robert Koch published his great research, in which he announced the discovery of the tubercle bacillus, and gave convincing proof that the growth of this micro-organism in the system was the true immediate cause of tuberculosis.

It was now possible to determine the presence of infection in any part of the system, and thus to show how the disease spread in the body. It was also easy to determine which of the excreta were most dangerous, and to prove that in cases of pulmonary tuberculosis the germs were most numerous in the expectorations. Where the bowels were affected, the germs were also abundant in the excreta.

It was also demonstrated that tuberculosis was common in the ox and the pig, less common in the horse, but liable to be present also in other mammalia.

Shortly afterwards, Schill and Fischer showed that tubercle bacilli remained alive and infective in dried sputum for a few months under suitable conditions, so that the danger of infection was a very real one.

Cornet, in 1888, still further proved the reality of this danger by showing that guineapigs inoculated with an emulsion of dust from infected rooms contracted the disease.

Koch again showed that cultures of the tubercle bacillus were rapidly destroyed when exposed to direct sunlight—an important fact confirmed by Ransome and Delépine.

In 1886 I was appointed Medical Officer of Health for Oldham, and it appeared to me that the facts were sufficient to indicate that public health measures would be required, but that any application of them must depend on an intimate knowledge of the mode and conditions of infection. I therefore visited a series of houses in which deaths from tuberculosis had occurred, enquired into the conditions under which the infection appeared to arise, and made a statement on the subject in my first Annual Report in 1886.

I was much struck, as a result of that enquiry, by the absence of any history of human infection in many of the children who had died of the disease.

In 1890, I visited the houses at which a second series of deaths had occurred, and while the history of infection in cases of pulmonary tuberculosis was as striking as before, it seemed to me that one was in a position to say that healthy persons do not contract tuberculosis except after intimate and prolonged exposure to infection.

In the interval between these observations, I was commissioned by the Medical Society of Oldham to visit Berlin, and report whether it was desirable to adopt the new system of treatment with tuberculin.

The conclusion at which I arrived was that it was not desirable, with the knowledge then existing, but that tuberculin was an excellent means of determining the presence of the disease in obscure cases, if used in very small doses.

In 1892, the relation of tuberculosis to Public Health was brought before the North-Western Branch of the Society of Medical Officers of Health, and in 1893 before the Central Society. The notification of tuberculosis was then advocated, and, although much discussion followed, no action ensued. In these procedures Dr. C. E. Paget, then of Salford, took a leading part.

Later in the same year the proposal to make tuberculosis a voluntarily notifiable disease was laid before the Medical Society in Oldham, and, after prolonged discussion, a scheme was agreed to which was then placed before the Sanitary Committee, but was not accepted by them. This proposal differed from that which I proposed earlier in 1893 in not treating tuberculosis as an infectious disease in the same category as scarlet fever or enteric fever. But it was found that this proposal had no chance of being carried.

The scheme of the Oldham Medical Society was in all essentials the same as that adopted in New York in the same year, and as the scheme adopted in Manchester in 1899.

In all these measures I received the greatest assistance from my friend, Dr. G. J. Robertson. Meanwhile a constant propaganda continued.

When I came to Manchester in 1894, I found that some public health steps had been taken of a tentative character.

Tuberculosis was a disease to which Professor Delépine had given long and profound study, and on which he was eminently fitted to advise. In fact, he had advised as regards the general measures of disinfection which it was desirable to adopt. But many considerations had to be taken into account before raising the question in a complete form, and the views of the medical profession had to be ascertained and consulted.

The staff of the Consumption Hospital, and especially Dr. Arthur Ransome, had directed their attention to the prevention as well as to the cure of tuberculosis, and leaflets of advice had been issued in connection with the cases attending the hospital. No doubt, with so strong a combination as Professor Delépine, Dr. Ransome and Dr. Tatham, some public scheme for dealing with tuberculosis would have been launched had Dr. Tatham remained in Manchester. As it was, the matter was necessarily put off by my appointment.

By 1899, however, the subject had been still further ventilated, and it was possible to lay before the Council proposals for dealing with the danger of tuberculous infection both from human sources and from milk.

These are set forth in Reports to the Council. As regards the scheme presented for the voluntary notification of phthisis, the Council sent it back for reconsideration, and it was only after considerable delay and strenuous advocacy by Dr. Daniel Leech, and by the Manchester and Salford Sanitary Association, that the proposals put forward were carried at a subsequent meeting. In 1898, the Association had urged the Council to adopt a scheme of notification. The proposals put forward provided for the appointment of three medical assistants to carry out enquiries, to give advice, and to see that the necessary administration was carried out. It thus became possible to get a body of evidence, collected by competent observers by direct enquiry, as to the manner in which tuberculous infection occurs and may be prevented, an invaluable gain.

But public instruction had not been neglected during the long interval between 1886 and 1899. On three occasions in Oldham, by the kind offices of Mr. (now Sir) Robert Peacock, pamphlets of advice had been sent to every house in Oldham, and the same course was adopted in Manchester soon after my appointment. The public were, therefore, prepared for the procedures adopted. The medical profession in Manchester were made acquainted with the proposed notification by a statement given to the Manchester Medical Society and published in the *Medical Chronicle* in 1897.

Further, from an early period of my work in Manchester, special attention was directed to the production of milk within the City. The proposals for dealing with infection from milk were based on researches by Professor Delépine, on inspections of the City cowsheds and cows, and on the examination of City cows by the late Mr. James King, M.R.C.V.S., a most able official. It is also worth mentioning that a number of cowsheds were suppressed as the result of my inspections.

The proposals in regard to milk, accepted by the City Council in 1899, as altered at a Town's meeting, were thus well considered, and were further amended and restricted by the Local Government Board.

The proposals respecting the voluntary notification of phthisis, sanctioned by the Council, were only gradually introduced, administration being at first confined to cases notified by public institutions. The object was to ascertain the difficulties involved and to overcome them before adopting the whole programme. In the first instance, also, only one official was appointed, Dr. Harold Coates, now retired.

The methods adopted were the same throughout. An extensive report form had been drawn up and was filled in for each case visited, and upon this the routine procedures were based. Two courses of disinfection were adopted, one based on Esmarch's research, consisting of the careful cleaning of all surfaces with dough. This was the method adopted when disinfection was left to the householder.

When, however, disinfection was carried out by the Cleansing Department, all surfaces were brushed down with a solution of chlorinated lime (guaranteed by the makers and also determined by actual chemical test, for each jar used, to contain 35 per cent available chlorine), in a strength of 1 per cent. This was afterwards changed to 2 per cent as it was found that by the time half a bucketful of disinfectant solution had been used the strength was only 1 per cent. The second half of every bucketful of solution was, therefore, thrown away.

This method of disinfection is due to Professor Delépine (except the modification of procedure mentioned above), who had found that when the diluted solution mentioned is applied to a rough surface a very active disengagement of nascent chlorine occurs.

In addition to the disinfection carried out initially, the patient's relations are expected to carry out a thorough cleansing every three months. Before the war this was done, so far as walls were concerned, with dough, other surfaces being washed, but this method had to be discarded during the war owing to the scarcity of flour.

It was hoped, however, that if the instructions given to the patient as regards personal precautions are carried out, these subsequent cleansings will be of secondary importance. For the purpose of carrying out personal precautions the patient is supplied, whether at home or in hospital, with a cardboard box and lid both tarred internally by hand at the office, into which he is expected always to expectorate, the box when full being picked up by the lid and bottom and deposited at the back of the fire.

The patient's clothes receive attention, and he is expected not to allow them to become contaminated. It must be admitted, however, that, even in the case of careful and well-instructed patients, there remains a danger that personal clothing will be infected in the act of coughing and otherwise.

When he is outside the house he carries a sputum flask, with which he is supplied in suitable cases, as he also is with printed directions how to use it.

Formerly, also, he was furnished with sheets of waxed tissue paper into which he might cough, and which, when crumpled up, could be carried in the pocket without contaminating either that or the hands.

The filling up of forms is now entrusted to nurses, and as the number of cases living and under observation has enormously increased, the supervision of these patients is now a very arduous task.

In carrying out this administration I had the assistance of a most admirable body of assistants, Dr. G. F. McCleary, Dr. James Beatty, Dr. James Cowie, Dr. Duncan Forbes, Dr. B. K. Goldsmith, Dr. T. Carnwath, Dr. J. R. Hutchinson and Dr. Barbara Cunningham.

Dr. D. P. Sutherland was appointed in 1912 to take charge of tuberculosis, and since then the department has been practically a separate one.

Dr. McClure and Dr. W. A. Young have been engaged almost entirely in general public health work, and in fact, a number of their predecessors were largely occupied with other matters besides tuberculosis, a position which was becoming an impossible one, especially in view of the changes foreshadowed by the National Insurance Act, 1911, and with the extension of public health administration in new directions.

Accordingly, in 1912, the Public Health Committee appointed Dr. D. P. Sutherland to deal with tuberculosis solely, his appointment being, in the first instance, a public health one.

Dr. Sutherland was at that time working for the Board of the Consumption Hospital, and his clinical reputation was high, no unimportant matter. When the arrangements were subsequently made for the extension of treatment under the Act, the direction of the Dispensary and the general control of the scheme from the clinical side naturally fell to him. For a time I retained an interest in the public health side, but during the war he was asked to make all the arrangements in connection with public health, as well as with clinical matters.

This appointment was a most fortunate one, as not only is Dr. Sutherland deeply imbued with the public health spirit in addition to his clinical eminence, but he is an able administrator and man of business.

In 1899, Mr. G. H. Lock was placed in charge of the public health investigations, and, being an educated man, he was able to take and did take a great and intelligent interest in the scheme and in the investigations. His co-operation was of the utmost value as it kept up the spirit of the work, and enabled the full value of the investigations to be attained. I cannot speak too highly of the manner in which he threw himself into the work, or of the devotion which he gave to it.

I may now revert to the principle underlying the scheme.

It had been abundantly proved that tuberculosis is a communicable disease, in which conveyance from person to person could often be traced. It was, therefore, and is, the business of the Public Health Authorities to treat cases of tuberculosis as cases of preventible disease, and to use every means possible in each individual case to prevent the infection from being communicated.

In order to do this, it was necessary to obtain access to individual cases, to ascertain by thorough enquiry in what manner and under what conditions the disease was communicated, and, with that knowledge gained, to take all necessary steps to save those exposed to risk. This was what the scheme proposed to do, and what it largely carried out.

From an early period criticisms were levelled at this direct mode of attacking the disease. It was pointed out that conditions of housing

were very important factors in determining mortality from tuberculosis, and that the death rate was much the highest in one-roomed dwellings, descending as the number of rooms increased. That, of course, is the behaviour of any infectious disease, and, moreover, involves the fallacy that families impoverished by the presence of tuberculosis will be found dwelling in restricted accommodation. But the inference was drawn that the true remedy was the clearing of slum dwellings. If economic conditions could be altered at will, and were or could be independent of physical strength, much might be said for this view. All experience, however, was against the possibility of any such rapid change, and, in any case, the possibility of amelioration in the economic condition of the population, and in housing, was no excuse for neglecting direct action founded on an intimate knowledge of the disease. Indeed, it may be said that there was a constant tendency to deny in effect, if not in words, the identity in point of infectiveness of tuberculosis with other infectious diseases, and still is to a less extent.

It is, of course, manifest that improvement in the economic condition of the working classes is bound to produce a great effect on the reduction of tuberculosis.

It is only necessary to note the much slighter incidence of tuberculosis, and still more of tuberculosis mortality, on the well-to-do than on the poorer section of the community to see that this is so. On the other hand, by no change in social conditions is it possible to prevent the sharp edge of distress affecting the less fit members of the community, and any attempt to do so must be partial and founded on intimate study of individual conditions.

Nevertheless, much has been done. By the provision of public parks and open spaces, the poorer section of the community have been enabled to get some access to sunlight, fresh air, and freedom of movement, though it is very desirable that this provision should be made more accessible, especially to mothers with infants, and to young people generally. The Education Department have given increasing attention to the physical education of the young, and to the provision of opportunities for recreation, although here again their efforts have been much restricted.

The great improvements which occurred over a series of years in respect of the conditions of labour, especially for women and children, were also certain to reduce the incidence of tuberculosis by increasing resistance to invasion, as were also the many improvements introduced into factories.

But the investigations carried out, even under a voluntary system of notification, enabled precautions to be applied just where they were most needed, and also threw a flood of light on the problems of infection. It was impossible to doubt, in face of a series of cases adequately

investigated, that infection was constantly being conveyed from the tuberculous to others not yet visibly affected, and it was usually possible, within reasonable limits, to fix the source of infection in cases of pulmonary tuberculosis and the length of the period of invasion.

It has been supposed, because some foci of infection can be demonstrated in a large portion of the community at a comparatively early period of life, that the infection, of which later in life we see the manifestation, is somehow implanted early in life, and only becomes manifest subsequently as an extension from earlier lesions. A study of the histories of infection, however, shows very clearly that most of the attacks which present themselves in adult life are the result of infection occurring within recent years. Whether those so infected have or have not been previously affected with tuberculosis in a minor form appears to matter little so far as the main infection is concerned—at all events, in the majority of cases. This conclusion agrees with the distribution of notifications in groups of ages.

From these histories it is possible to obtain an idea of the latent period between the final infection and the illness which was notified. In the *British Medical Journal*, 1908, Vol. II., p. 561, an endeavour was made from the enquiry sheets to ascertain what is the latent period and what is the duration of illness. While both periods are very variable, it is shown that the most common latent period for pulmonary tuberculosis is from a year to 18 months, while the most frequent duration of illness is between one and two years. The duration of illness is, however, not only very variable as a matter of individual experience, it is capable also of considerable extension under suitable treatment.

A statement of the methods pursued was given at an early period after the introduction of notification in a communication by the late Alderman McDougall to the International Congress on Tuberculosis, in 1901, afterwards reissued with slight additions, which gives the various forms then used, while a sketch is also given of the objects of notification in the *Medical Chronicle* for 1898, and in the *British Medical Journal*, 1908.

The first medical assistant appointed was Dr. Harold Coates in 1899, shortly after the passing of the scheme. Not only did Dr. Coates confirm the results of Cornet's work, but he also strengthened it by showing that the dust found in dirty rooms not recently occupied by tuberculous persons was not infective to guineapigs, and that badly-lighted rooms remained in an infected condition, while the infection quickly died out in rooms which were well lighted. Dr. Coates also showed that the method of disinfection by the application of a dilute solution of chlorinated lime, as designed by Delépine, is effective.

Notification was extended to all practitioners in February, 1900, and in May of the same year Dr. G. F. McCleary was appointed a second assistant.

In 1901 Dr. Coates and Dr. McCleary were appointed Medical Officer of Health to Hornsey and Battersea respectively, and were succeeded by Dr. James Beatty and Dr. James Cowie.

In the Annual Report for 1901 a very elaborate and excellent report is given by Dr. James Beatty. Dr. Beatty also instituted an enquiry into cases which appeared to be traceable to house infection, and arrived at the conclusion that such evidence as existed pointed to the conclusion that the methods of disinfection and cleansing pursued were effective in preventing infection.

Dr. Beatty's report gives a full account of the methods pursued, and a very complete account with illustrative cases of sources of infection under such heads as personal contact outside the workshop, infection from infected houses, milk, public-houses, infected clothes, at work, office cleaning, from railway carriages, infection of non-pulmonary cases, etc.

Dr. Beatty left in 1902 to become Medical Officer of Health for Northampton.

Temporary treatment of consumptive patients began at Clayton Hospital in that year, but was interrupted by smallpox.

In 1902 the materials already accumulated were used to discuss the question of occupation. The social conditions under which workpeople were living were shown to have a powerful effect on the incidence of tuberculosis; so much so, as at times to obscure the special effects of occupation. The high incidence of tuberculosis on adult male workers in towns was explained by two circumstances—the prevalent habit of expectorating in the workshop (a habit not shared by female workers), and the relatively great extent to which men resort to the public-house, where expectoration on the floor was then prevalent.

Notices in reference to spitting were distributed to factories and workshops and to public-houses, and were placed in the tramcars, in which spitting was then prevalent. Figures are given by Mr. Lock illustrating the enormous amount of infection discharged in workshops by men suffering from pulmonary tuberculosis.

The relation between occupation and phthisis is discussed at greater length in the *British Medical Journal*, 1902, Vol. II. The practical suggestion is made that the floors of factories should be frequently wet-swept with the aid of a disinfectant.

In 1903 Dr. James Cowie considers the possible influence of schools in the spread of tuberculosis. There is but little positive evidence of the spread of the disease in schools, though there is a presumption that a slight infective influence exists in some schools.

Dr. Cowie also furnishes a list of disease conditions which might be regarded as having predisposed to infection. The more important are

pneumonia, influenza, injuries, chronic bronchitis, and pregnancy, though the last-named condition must be regarded as rather lighting up foci already existing than as preparing a soil for their establishment.

In 1903 Dr. Duncan Forbes was appointed medical assistant, and in 1904 he writes a statement on tuberculosis which, besides the usual tables and data, deals with infection. He adopts the view that the disease is conveyed in the act of expectorating by droplets or fine spray, and points out that a consumptive should not occupy the same bed with another person, and that a consumptive who coughs a great deal should not be in the same bedroom with another person. These essential points are, however, equally urgent, whether infection takes place by droplet infection or by means of dried expectoration. Incidentally they make it of great importance that the bed and personal clothing of tuberculous patients should undergo frequent disinfection, and that in addition they should be specially warned as to the danger of infecting bed and other clothes.

In 1904 Dr. Cowie was appointed Medical Officer of Health to Burton-on-Trent.

Early in 1905 the Crossley Sanatorium was opened, and 20 beds were secured by the Corporation for their notification scheme. The statement on tubercular phthisis in the Report for 1905 consists mainly of a review of the scheme up to date. Section I gives a brief account of the development of the Consumption Hospital, which was started in 1875, and of the Notification Scheme of 1899, with a summary of its objects.

The scheme had provided (1) for the appointment of three medical assistants (in 1903 two sanitary inspectors were substituted for the third, who was, however, still considered to be required), (2) for a hospital to contain 200 beds to be provided for advanced cases, (3) for bacteriological examination of sputa. The provision of hospital accommodation in connection with the scheme had proved to be a necessity, as it had been found greatly to facilitate the compliance of notified cases with administrative requirements. The actual accommodation available at this period for cases of pulmonary tuberculosis consisted of 20 beds at the Crossley Sanatorium, 25 beds at Mrs. Crossley's Home of Peace, 32 at Clayton Hospital, 204 at Crumpsall Infirmary, 129 at Withington Infirmary, and 12 at Prestwich Union. But only 52 were available for the scheme, although it was perceived that public health measures were intimately bound up with hospital provision worked in association with them.

The economic difficulty of consumption is raised, and the Corporation is asked to establish a fund to assist tuberculous families.

It is also proposed to make provision for finding occupations for discharged patients. Part II. deals with the details of the scheme,

though it is only necessary to mention Mr. Lock's very complete account of the arrangements for disinfection.

Allusion is made to the byelaw prohibiting spitting in public places adopted by the Council in March, 1904, which afterwards was so used as to banish spitting from the tramcars, and less completely from the Town Hall. This Report contains a very full statement of the work being carried on at that time.

The Report for 1906 again deals very fully with various aspects of prevention. The question is again considered of the alleged danger from sprayed infection in the act of coughing as distinguished from dried expectoration. From the former cause clothes and hands are especially liable to be contaminated. The contamination of hands is important—perhaps the most important fact—in connection with tuberculosis, and the care of the hands is a matter in which instruction is specially required, and is always now given.

The value of segregation in Union Hospitals in the past as a cause of the reduction of tuberculosis is discussed. While the value of segregation carried out under suitable conditions is recognised, it is not believed to have exercised the influence claimed for it in the past. Much more is believed to have been due to growing prosperity, better and cheaper food, cheaper clothing, improvement in housing, increased facilities for travel with consequent diminution of intermarriage, improvement in the conditions of labour, etc. The subject is very fully discussed.

A summary is given of the Report of the Royal Commission on Tuberculosis, appointed in 1901 to consider the question of the communicability of bovine tuberculosis to man and of human tuberculosis to animals. It is shown in that Report that bovine tuberculosis of a fatal character is communicable to man, though it is doubtful whether the reverse process occurs, and that the number of cases infected—principally through tuberculous milk—is considerable, especially in childhood. Bovine and human tubercle bacilli are shown to have distinct characters, from which it is deduced that many children suffer from bovine tuberculosis. The conclusion is drawn that raw milk from cows plainly suffering from tuberculosis—whether of the udder or not—should not be used for human food. But we are still far enough from securing this requirement.

Dr. Calmette's views are then discussed. He holds that nearly all cases of tuberculosis arise from swallowing tuberculous infective matter, and for this view he gives experimental evidence. But his conclusions have not been accepted in this country. At the same time their vigorous advocacy by Dr. Calmette serves to emphasise the immense importance of preventing the ingestion of tuberculous material in many unregarded ways.

At page 154 is given a list of family incomes, showing by how much they come short of the minimum required for subsistence, and again raising the question of a special fund, which for that year is estimated at £1,500.

The relation to occupations is very fully discussed with the aid of figures prepared from the investigation sheets by Mr. Lock.

In 1906 Dr. Duncan Forbes was appointed Medical Officer of Health for Brighton, and Dr. B. K. Goldsmith was appointed Assistant to the Medical Officer of Health.

Allusion may be made to an investigation by Dr. Goldsmith, who investigated the cases notified from a district in Ancoats, with a view to determine the causes producing a more than usually heavy incidence on the houses of a particular area. After carefully sifting the facts, he arrived at the conclusion that in this area, at least, exceptional incidence was due to the shifting character of the population, and consequent intimate mixing of tuberculous and other persons, and not to the influence of the houses. This was an attempt to review the alleged influence of particular houses in New York, and threw great doubt on the influence of house infection, as contrasted with personal contact or with personal infection superadded to house infection.

The chief feature of the Tuberculosis Section in the Annual Report for 1907 is a table prepared by Mr. Lock giving a long list of cases in which the circumstances of families or individuals is below subsistence level. The need for a grant to assist the families of such cases, so as to avert the incidence and progress of infection is again urged.

In 1908, the materials in the enquiry sheets were utilised to institute an enquiry into the influence of injuries in causing or lighting up tuberculosis. The need for assistance to families suffering from tuberculosis is again emphasised. Dr. J. R. Hutchinson was appointed Assistant to the Medical Officer of Health, and takes up the work. Dr. T. Carnwath was appointed Assistant to the Medical Officer of Health and Medical Officer of Health in Withington, and, on his appointment to the Staff of the Ministry of Health in 1910, was succeeded in the latter position by Dr. Hutchinson.

At this point, the line of distinguished officers who were appointed in connection with tuberculosis comes to a temporary conclusion, their successors becoming more purely Public Health Officials. They were: Dr. M. B. Arnold, in 1910; Dr. Bywater and Dr. McClure, in 1911; Dr. Barbara Cunningham, in 1912; and Dr. W. A. Young, in 1914. Allusion should be made, however, to the excellent work on tuberculosis done by Dr. Cunningham, and especially to her clinical work at Clayton Hospital.

The Annual Report of the Medical Officer of Health for 1909 records the Order of the Local Government Board making notification compulsory for all cases coming under the care of the Guardians.

At page 101 is given a calculation by Mr. Lock showing the loss of wages in 1909 sustained by 778 tuberculous men and 263 tuberculous woman at work, amounting to £48,129. This, however, does not nearly measure the total loss incurred.

The incidence of mortality in the different districts at groups of ages, for both males and females during the years 1901-05, is given at page 109—according as deaths occurred at home, at a Union Hospital, or at other institutions. A complete picture is thus presented of the influence of poverty, so far as it can be rendered statistically, and the close alliance between tuberculosis mortality and poverty is fully shown.

A table at page 113 gives in this as in other years a comparison between the numbers notified and the numbers who died from tuberculosis, and shows the great inequalities in notification, which is fairly carried out only in the poorer districts. True, it is in these that it is most needed.

Special allusion is made to the work of Mr. Lock in seeking out assistance for consumptives, page 114.

The investigations (page 119, Annual Report for 1909) into notified cases enable us to see how far drift occurs into the City and its different main divisions from outside, and also from one division to another. At page 85, Annual Report for 1910, this matter is again investigated for four years, 1907-1910. It appears that out of 5,594 Manchester cases, 1,045 were infected outside. More than four-fifths appeared to arise within the City. The greatest amount of drift inwards is into the central districts, as might be expected. There is also a considerable amount of exchange between one division and another, but no material balance in favour of one over the other. The chief factory of tuberculosis is in the Manchester Township.

It is in close association with poverty, crowding and malnutrition. How immediate and striking are the consequences of impoverishment may be seen from the figures for 1921 as compared with those for 1920. The relation of poverty to tuberculosis in Manchester is discussed in a communication to the Royal Society of Medicine, 1909.

In the Report for 1910 is given an investigation into the relation of tuberculosis to public-houses in the different sanitary districts of Manchester (page 89). The number of public-houses per 1,000 of the population in the main divisions of the City might almost stand for the relative death rates from tuberculosis, on the one hand, or for the relative amounts of poverty on the other. The highest proportions in individual districts are in Central, Ancoats and Hulme. The importance

of these figures as regards tuberculosis rests on the power of public-houses to produce poverty on the one hand, and to scatter tuberculous infection on the other. Public-houses should be under special regulation as regards spitting and other matters, and it may well be considered whether the use of alcohol should not be prohibited.

The Education Authority are given an estate for the treatment of pre-tuberculous children.

Table 15, Annual Report, 1910, drawn up by Mr. Lock, shows the history of deaths in cases registered and unregistered respectively from 1899 to 1910, from which it will be seen that as the years advance the proportion of registered to all deaths increases. It is not possible to infer that notification is improving year by year, but it is clear that cases missed in one year came into the notification net the next, so that ultimately we should get them all in.

In the same report (pages 99-107) is given a statistical investigation into the relation of tuberculosis to other forms of lung disease, which has acquired increased value now that pneumonia is notifiable. I will only observe here that the figures show that the improvement already manifest in the death rate from tuberculosis is not due to transference of deaths to other forms of lung disease, which show a like improvement.

A matter of considerable interest and importance arose in 1910, which is fully discussed in the Annual Report for 1909. The South Manchester Guardians waited on the Sanitary Committee and urged upon them the provision of 200 beds (as advised in 1899) to be built and run by the Sanitary Committee, proffering in return to make provision in aid of the families of tuberculosis patients. In the report which I made to the Committee on these proposals, the whole of the work being done was discussed. The number of beds already available for tuberculosis of the lungs was given at 585. It was manifest that the 200 beds proposed would be insufficient to meet the whole of the need even as an addition. The staff available for public health work in tuberculosis was inadequate and wanted strengthening, as the work was steadily increasing, and neither instruction nor supervision were sufficiently provided for. In order that we should be aware of the magnitude of the task before us, compulsory notification was advocated. The proposal to give assistance was discussed, since, in my opinion, the giving of assistance was part of public health work, and required careful working out under the scheme.

On the Report for 1910, page 94, are given figures intended to elucidate the question whether tuberculosis is more the cause or the consequence of poverty. So far as they go, they create the impression that tuberculosis is more the cause than the consequence.

In the year 1911, two Orders were issued by the Local Government Board, the first requiring notification of cases of pulmonary tuberculosis from all institutions, the second making cases notifiable by practitioners generally. The effect of the latter is seen in a great increase of notifications in 1912.

There is given among the tables in successive Annual Reports relating to matters arising under the notification of tuberculosis one into which Mr. Lock has collected a summary of various matters transacted, and particularly the details of disinfection. In this table appears, for the first time in the Annual Report for 1910, page 86, the number of cases under observation, that is to say cases who have been notified and have not yet died. This line comes under two others, the number of registered cases who died in each year, and the number of cases whose deaths were ascribed to tuberculosis whether previously notified or not, from which two figures we deduce the number of deaths of phthisical persons whose attacks had not been notified. Take, for example, the figures for 1911, 832 deaths occurred amongst registered cases, as compared with 284 who had not been notified. The number of notified cases under observation is 3,484. If we assume that a corresponding number should have been notified and under observation for the 284 as for the 832 deaths, viz., 1,189, and add these to the known cases 3,484, we get 4,673 as the probable number of cases in the City. The corresponding number for 1912 is 4,799. Now, if this table be followed through, it will be found that in 1921 the number of cases actually under observation is over 8,000. It is difficult to account for this great accumulation of cases. The obvious interpretation, of course, is that the amount of treatment and care bestowed on the cases in the years following has prolonged life in the tuberculous. The same tendency to accumulation is shown in the first 10 years, but to nothing like the same extent. However, the obvious interpretation is not always the true one, and it may be that no inconsiderable additions come as transfers from other sources, such as chronic bronchitis. However that may be, the amount of work required to look after all these cases steadily increases, and increased demands are made on the staff. We are singularly fortunate in having had so excellent an investigator as Inspector Hewitt from an early period, or the lack of medical enquiry would have been more severely felt.

The investigation sheets were, of course, filled up by special investigators, but the constant supervision required was carried out by the general body of sanitary inspectors and by health visitors.

At this point it may not be amiss to give a brief summary of the position up to the introduction of the National Insurance Act, 1911.

While fully recognising the great influence of other sanitary and social improvements, those who were acquainted with the researches

which had been carried out on tuberculosis were aware that it was necessary to attack the disease directly by an intimate study of individual cases and by adapting the ordinary methods of dealing with infectious disease to this particular case. For this purpose it was necessary to adopt a system of notification which, after prolonged education and effort, was done in Manchester in 1899, but only in so far as the voluntary notification of pulmonary tuberculosis was concerned.

Even at that period it was recognised that a considerable provision of hospital accommodation was necessary in order that the proposed measures of administration might be received with acceptance.

On the adoption of voluntary notification, a system of enquiry was at once established, and of measures adapted to diminish infection from the cases notified. The records have been carefully preserved and classified, and summaries have been given in successive Annual Reports. They illuminate the methods of spread of the disease, and furnish much valuable information for further action. It was at first intended that this work should be carried on by medical assistants, but circumstances led to its transference gradually to trained sanitary inspectors and nurses working under medical supervision.

No one who studies those records, or who uses them intelligently, can fail to arrive at the conclusion that tuberculosis is an infectious disease, communicable at all periods of life, and conveyed from person to person, more especially at industrial ages, and this impression is immensely strengthened by personal investigation.

There are various modes of conveyance, though in man the material of infection is chiefly the expectoration discharged from tuberculous lungs. This is largely carried through the dust arising from dried expectorations, though also by infected clothing and hands. Direct transmission by droplet infection has, also, probably a more limited range. Infection is also conveyed by milk from tuberculous cows, and probably almost entirely when the udder has been invaded. In the year 1907, Miss Eleanor Greg, afterwards Mrs. S. Grundy, carried out for me an enquiry into deaths in young children ascribed to tuberculosis, and analysis of her data led to a clinical division of cases into those of human and bovine origin not very different numerically from the division given by the researches for the Royal Commission on Tuberculosis.

It was, therefore, necessary to carry out an elaborate system of instruction in tuberculous households, and also to remove as far as practicable tuberculous matter already deposited.

Incidentally, many cases not known to be tuberculous were discovered, both pulmonary and non-pulmonary, and measures were taken to bring them under medical supervision.

In dealing with tuberculous expectorations, it was necessary to provide means whereby a consumptive could avoid spreading infection. He was, therefore, furnished with tarred cardboard boxes into which he could expectorate at home, and which were burned after use, with sputum flasks for use out of doors, and with waxed tissue paper on to which he could cough, and which could be crumpled up so as not to contaminate his clothes. A campaign was instituted against expectorating in public places, and a byelaw was obtained. Expectoration was abolished gradually in the trams, and much diminished in common lodging houses. Less effect was produced in public-houses, though gradually improvement was brought about.

It is much less easy to deal with excreta, especially from tuberculous children. Careful cleaning and the care of the mother's hands—especially before she handled food—were enjoined.

The danger of infection by contaminated hands and contaminated food has become more and more prominent.

The economic aspects of tuberculosis came very early under consideration. It is largely a disease of poverty. Wretched people of little stamina, who soon give up the struggle of life, crowd into common lodging houses, and there are always some suffering from tuberculosis. It is almost inevitable that these should become centres of infection, and the death rate amongst their inhabitants is prodigious. They contaminate each other, and carry their infection into the numerous public-houses which adjoin their abodes, where they spread the disease which radiates from them as centres. Their history indicates how tuberculosis is propagated in other crowded quarters of the poor.

Tuberculosis is a poverty-making disease. It has been estimated that 40 per cent of the existing poverty is due to it. It assails more particularly workers in the prime of life. Necessity compels the tuberculous worker to work when he can, and when he works his disease generally progresses. All the advances which have been made in the way of sanatoria and insurance against sickness are but ameliorations, and the example of Germany made it only too clear that this would be the case. They prolong the struggle, but they do not diminish the infection. To this an exception must be made in the case of the comparatively small but not insignificant percentage of persons whose disease is arrested. As the end approaches it is to be feared that all the preventive measures adopted in the home are defeated, at least in part. The pillow and other parts of the bed clothes and surroundings become contaminated, more especially as necessity compels those who should attend the dying to engage in other occupations.

The struggle to reduce tuberculosis is, therefore, an arduous one. In 1905 I first drew attention to the effect of the presence of tuberculous

infection in depressing the family income below that necessary for bare subsistence, and a series of tables was thenceforward prepared by Mr. Lock, year by year, showing the numbers so depressed and the amount of depression, and a continued appeal was made for public assistance to such families. The object of the assistance was to be primarily to raise the maintenance level of other members of the family, so that they should be able to resist invasion by the disease, which assails with comparative ease frames weakened by malnutrition. But it was also proposed to furnish bedding and bed clothes to the tuberculous patient, so that he might be isolated and be enabled to support the open window.

The amount originally proposed was £1,500 per annum, but as the records became more complete the proposal rose to £5,000. A sum of £1,500 was ultimately granted in 1914, and afterwards increased to £2,000. It will readily be understood, however, that in such a year as 1921 this sum was very inadequate. Indeed, it never has been adequate, except for those more immediately under subsistence level, other cases being left to the Guardians.

The assistance so granted is to be strictly conditional on the families assisted carrying out strictly all the measures of precaution enjoined by the Tuberculosis Officer. I regard this as one of the most beneficial advances hitherto made in dealing with tuberculosis.

Up to 1912 the provision made for treatment of tuberculosis in immediate touch with the Tuberculosis Department was but limited, and did not approach that asked for in my Report to the Council in 1899. The actual amount of treatment in the City was not small, and might be placed at 650 beds, mostly in Union Hospitals. But the number of beds under the control and subject to the instructions and administration of the Preventive Section was small. Infinitely the most important aspect of treatment is the extent to which it may be utilised for securing measures of prevention. In the view of Sir Arthur Newsholme, K.C.B., the way to influence the adoption of measures of precaution at home is to remove patients to hospital for brief periods, and there instruct them in measures of prevention which they can carry home and enforce. That may be true of a few cases, and under the special eye of particular men. Indeed, I have myself used this procedure. But, in the enforcement of preventive measures, I regard it as secondary to instruction and supervision at home.

When the larger schemes of treatment, under the Insurance Committee, came into force, the carrying out of this scheme of instruction necessarily came under men whose heart was in treatment, and who would naturally find a system of preventive instruction and drill distasteful and depressing. No doubt good has been done, but my impression is that this immensely important use of sanatoria has been generally but

imperfectly appreciated. On the other hand, the provision of additional beds and of sickness benefit under the National Insurance Act is a great boon—at all events, in ordinary prosperous years.

In one of my reports I raised the question whether the Corporation could not provide workshops for the benefit of cases of tuberculosis in which they could be taught lighter occupations, with a view also to lightening the economic burden.

Amongst the alleviating agencies are the dinners given to school children by the Education Committee.

Dr. Sutherland has never ceased to urge his view that the economic difficulty could only be solved by the aid of colonies for moderately advanced tuberculous cases, which he considers could best be established and worked in conjunction with a hospital for tuberculosis, such as Baguley. This proposal has not been as yet carried into effect from difficulty in getting suitable land near the sanatorium, but I agree with him, though he would regard the assistance given to families on present lines as a necessary complement to the establishment of a colony.

Finally, assistance given to tuberculosis patients after discharge from a sanatorium is another necessary aid in dealing with cases of pulmonary tuberculosis. When the National Insurance Act took effect in July, 1912, a sum of £500 was earmarked for this purpose out of the contribution from Insurance Funds; afterwards increased to £800, and more recently to £1,500. This replaces the Samaritan Fund of £120 formerly raised by the Consumption Hospital—a sum, of course, quite inadequate. It is hopeless to expect adequate assistance from private individuals.

I would again repeat that there is no part of the public finance more important in the reduction of tuberculosis than the assistance granted, carefully weighed and used, with the object of reducing tuberculous infection.

The treatment of tuberculous children, and especially of non-pulmonary tuberculosis, has been advised from time to time, but only with urgency in the last eight years. The reduction in tuberculosis has been by far the most considerable in juvenile tuberculosis. A certain measure of treatment has been given at the Manchester Children's Hospital, Ancoats Hospital, and the Union Hospitals. The Education Committee have done admirable work under Mr. Telford's guidance at Swinton House and elsewhere, but the provision so far made is not nearly adequate. The view of the French is that tuberculosis is a disease contracted in childhood, and that in childhood it can be arrested. Without accepting that view, I believe that, in the way of cure, children will give the best results. Moreover, the treatment of children adequately by expectant treatment is a crying need.

Even before 1912 a marked reduction had occurred in tuberculosis in Manchester, and the position of the City relatively to other large urban communities has now vastly improved. Nor need we fear any permanent interruption to progress. The one thing which would imperil it is a serious continued depression in trade, with the malnutrition which must result, and this danger may be checked, as it has been at least for a time, by judicious assistance.

The National Insurance Act, 1911, provided specially for the treatment of insured cases, who were to receive sanatorium benefit at the will of Insurance Committees; the term including treatment in sanatoria, at dispensaries, or by private practitioners. A sum of rs. 3d. per insured person per annum was assigned for this purpose. Of this, 6d. was to be for sanatorium benefit in the form of treatment by private practitioners. The remaining 9d. was under agreement with the Insurance Committee, handed over to the Corporation, who undertook institutional treatment, but was subject to important deductions, viz., the assistance to be given to persons suffering from tuberculosis, payment of drugs provided by practitioners, and establishment expenses. The amount received was small compared with that expended altogether by the Corporation. Provision was also made in the Finance Act, 1911, for a sum of £1,500,000 to be expended in aid of the construction of sanatoria.

The National Insurance Act made provision whereby sanatorium benefit could be extended to the dependents of insured persons, if the funds permitted—a provision which it has not been found possible to carry into effect. But this provision may be read in association with an order issued by the Local Government Board in December, 1912, making all forms of tuberculosis—non-pulmonary as well as pulmonary—notifiable, and crowns the end of successive Orders issued by the Board, under the guidance of Sir Arthur Newsholme. This was necessary, if on no other ground, to ascertain the extent of the provision which would require to be made for dependents. It was also necessary, however, in order to give fuller information as to the mode of spread of tuberculosis. For practical administration it was necessary to distinguish different forms. Disease of the bones and joints requires a totally different procedure from tuberculous meningitis, although both are part of one general disease.

Another consideration was this, that a system was for many years in existence which gave much information as to the distribution of tuberculous milk, and the notification of cases of non-pulmonary tuberculosis made it much easier—at least, in the very young—to trace the source of infection to milk, and thereby to strengthen administration dealing with milk.

In 1893, when I brought the subject of notification before the Society of Medical Officers of Health, I advocated that tuberculosis should be included among the ordinary notifiable diseases. It was not found possible at that time to adopt this course, which would have had many advantages, the greatest of which would have been that the infectious character of tuberculosis would have been sharply brought home.

This course might quite well have been taken at a later date, instead of which a disabling clause was inserted in the Orders which very much limited the power of local administration in dealing with tuberculosis. In my opinion, it is time that this step should now be taken, or, at least, more freedom of action given.

The National Insurance Act, 1911, entailed the preparation of schemes for the administration of sanatorium benefit, and, in order to determine the policy to be pursued, a Departmental Committee was appointed by the Treasury, who published an interim report in 1912. Without going into the details of this report, it must suffice to say that its general object was stated to be to ascertain by what methods the prevention and cure of tuberculosis could best be achieved. While maintaining touch with the preventive work already established, it was necessarily mainly concerned with treatment. Machinery was to be set up which was supposed to be that due to Sir Robert Philip, in Edinburgh, and which was so in so far as the starting point of effort was to be institutional. The centre of the new system was to be the dispensary, to which was to be attached a Tuberculosis Officer, who was clinically to be independent of any other official. The functions of the dispensary are set forth in the report, but it must suffice to say that they could not satisfactorily be carried out without the Tuberculosis Officer having powers of supervision over the second element in the scheme, viz., the sanatoria and hospitals for tuberculosis to be provided. The third element in the scheme was the general practitioner, by whom much of the treatment must be carried on. The scheme was to provide treatment, not merely for insured persons, but also for the whole of the community. The authorities by whom this provision was to be made were County Boroughs and County Councils.

The new official of greatest importance was the Tuberculosis Officer, who had not only to direct the functions of the dispensary, but was the consultant and adviser for general practitioners, as well as being in intimate relations with the Medical Superintendents of the institutions to be set up. It is obvious, then, that for the success of the scheme he must be eminent both as a clinician and as an administrator.

The scheme put forward in 1912 consisted in the utilisation of the existing dispensary of the Consumption Hospital, the adaptation of

Baguley Sanatorium as a hospital for moderately advanced cases of pulmonary tuberculosis (to be enlarged to accommodate 309 cases), the taking over of the Abergele Sanatorium, which had been fitted up by the Withington Board of Guardians and accommodated 46 cases of pulmonary tuberculosis and 9 children suffering from non-pulmonary tuberculosis, and an arrangement whereby 62 out of the 100 available beds at the Crossley Sanatorium, Delamere, were secured under agreement. Clayton Hospital had, for a number of years, been used in the treatment of advanced cases of tuberculosis—men, women and children—and was temporarily included for the treatment of 68 cases of adult advanced cases after 1914. Agreements were made with the Local Insurance Committee, the Board of the Consumption Hospital, and the four consultant physicians of that institution. Plans were prepared by Mr. H. Price, the City Architect, for extensions at Baguley Sanatorium, but the hospital buildings did not meet with the approval of the Local Government Board, and ultimately their own scheme was adopted. There were several points of difference, but the most important was the provision of a corridor on the side facing the north, which after experience showed would have been a very desirable provision. In order that no time might be wasted, Baguley Sanatorium was opened at once in 1913, and the dispensary of the Consumption Hospital, with the beds at the Crossley Sanatorium, was at once made available.

An outline of the scheme which was, however, separately printed, is given in the Report for 1913, and includes provision of laboratories at the dispensary and at the institutions, and dental services. Arrangements were made for the appointment of a Care Committee, whose functions were to be (1) the management of the two funds in aid, already mentioned; (2) the finding of suitable employment for cases of tuberculosis.

The summary of the scheme for dealing with tuberculosis, given in the Annual Report for 1913, is as follows:—

ADMINISTRATION OF INSTITUTIONAL TREATMENT:

The Sanitary Committee.

Chief Administrative Medical Officer.

PUBLIC HEALTH OFFICE:

Organising Clerk.

Seven Trained Enquiry Officers.

Part services of 28 Sanitary Inspectors and 18 Health Visitors.

Eight Subordinate Clerks.

Ambulance (Motor) Service.

SANATORIUM SCHEME :

- Senior Tuberculosis Officer.
- Four Consulting Physicians.
- Two Assistant Tuberculosis Officers (not then appointed).
- Two Clerks.
- Two Nurses (six not yet appointed).

CHIEF INSTITUTIONS :

Baguley Sanatorium	300 beds.
Abergele Sanatorium (to be extended)	55 „
Crossley Sanatorium	62 „
Clayton Vale Hospital (temporary)	68 „
Surgical cases of non-pulmonary tuberculosis, Royal Infirmary	(about) 9 „

It will be seen that the staff of the Public Health Office had been extended to cope with the growing work. It was inevitable that, for a time, public health work would suffer in order to start the new scheme.

Under the Sanatorium Scheme eight nurses were provided, but for a time only two were appointed. It was, however, only a question of convenience when the rest would be required and could best be appointed.

Under the head of institutions, it may be noted that only 150 beds were immediately available at Baguley Sanatorium. The buildings, which are described in the statement attached to the Report of the Finance Committee, dated 29th May, 1913, were completed in the end of 1914.

Appendix No. 2 by the Medical Officer of Health gives an outline of the proposals. In that scheme provision is made for five whole-time officers. Two assistants were subsequently appointed, Dr. R. Briercliffe and Dr. A. B. Porteous, and, notwithstanding the increased amount of work, Dr. Sutherland has even now only two assistants. It is certain, however, that the staff is at present inadequate. Dr. Briercliffe and Dr. Porteous, however, left the service to join H.M. forces. In 1915 Dr. S. C. Adam was appointed for the period of the war, and in 1916 his appointment was made permanent. In 1918 he resigned on receiving an appointment as tuberculosis officer. Subsequent to his retirement, Dr. F. Butterfield and Dr. P. A. Galpin were appointed as Assistants, and still occupy the same positions.

During the erection of the new buildings at Baguley Sanatorium there was necessarily a considerable amount of disorder, which was bound to act unfavourably on the patients. The first Medical Superintendent was Dr. Herbert S. Lister, who had conducted the business of Baguley Sanatorium as a fever hospital with conspicuous success. In 1915 Dr. W. H. Smith was appointed, and on his retirement in 1918, Dr. R. C. Hutchinson became Medical Superintendent.

In the earlier years of the sanatorium there were numerous complaints by the patients. Partly these were due to the disturbed state of the institution during building. Partly the patients, who were mostly insured persons, had an undue sense of their rights. Partly also, there was, perhaps, an undue amount of interference. Notwithstanding the high wages given, the cooking was not always satisfactory. But the difficulties quickly disappeared under the management of Dr. R. C. Hutchinson, who united ability and resource with firmness. On Dr. Hutchinson leaving to take up another position, Dr. Hugh Trayer succeeded to the post, which he now holds.

Dr. C. M. Craig held the position of Medical Superintendent at Abergele Sanatorium under the Guardians, and was by agreement retained in the position. He is a man of originality and large experience, and his first report in 1913, which gives his work on pneumothorax, sufficiently shows his ability. He could not rest, however, after the outbreak of the war, and soon joined the service. For some years his work was taken by Dr. (Miss) C. E. Warner, who would have been of great service had the Children's Hospital Scheme proceeded, as she was well-acquainted with the application of insolation to the treatment of the disease. She accepted a position in Ireland, and was succeeded in 1917 by Dr. A. G. M. Grant, who still holds the position. Probably he would like to see the sphere of his activities extended at the institution. His studies in the treatment of tuberculosis are briefly given in my Annual Reports.

More recently, through the energy of Dr. Hutchinson, the number of beds at Baguley Sanatorium has been increased, additional accommodation has been obtained for the staff, a day-room has been secured for the patients, workshops have been erected and worked which form, at all events, a nucleus for a larger scheme, and in other ways the problem of occupying the patients profitably has been tackled. Unfortunately, the opportunity of establishing a colony in 1919 was lost from lack of a suitable site. But this object is steadily held in view, and will no doubt be achieved by the removal of the difficulties now existing.

Additional provision for treatment of cases of non-pulmonary tuberculosis has recently been made by agreements with the Ancoats Hospital and with the Hospital for Diseases of the Skin.

A number of Manchester patients are under treatment at the Barrowmore Colony established by the Red Cross for discharged service men suffering from tuberculosis, an enterprise in which Dr. Sutherland has taken an important part.

A scheme for the treatment of tuberculous children has been under consideration since 1911, and has received almost continuous consideration since 1915. Proposals were finally formulated in 1920 for the provision of a sanatorium at Abergele after the Public Health Committee had,

on their own initiative, increased the number of cases proposed to be treated, from 400 to 500. The plans were prepared by Mr. H. Price, after consultation with the Medical Officer of Health and with Dr. Sutherland, who made many valuable suggestions. Further alterations were suggested by Dr. Hutchinson and Dr. Grant, and in part accepted. The scheme has been printed, No. 273 (September 30, 1920), was accepted by the Finance Committee and the Council, and is now before the Ministry of Health, who have given much assistance in amending and improving it. It provides treatment for 200 children suffering from bone and joint cases, 192 for pulmonary cases, 40 for children under two years of age, and 68 for other non-pulmonary forms, besides cases of bone and joint disease. It is intended that the children will be treated on the most advanced modern principles, and that educational and other facilities will be provided to fit them for their future career after leaving the hospital.

At the same time, an addition of 40 beds will be made for the treatment of adults suffering from incipient pulmonary tuberculosis.

The site projected for the Children's Hospital is a plateau facing the present administrative buildings, and admirably adapted for its purpose. At the same time, the approaches, the sewerage, and the water supply are all necessarily expensive, and the cost has hitherto proved a formidable obstacle, and is no doubt the chief reason why the scheme has not received the final approval of the Ministry.

In the Annual Report for 1913 the subject of assistance to tuberculous patients and their families is treated at considerable length by Dr. Sutherland and myself. More especially the question of occupations comes under review. It is made clear that under no conditions should the "crippled soldiers of industry" be placed in open competition with healthy workers, for the sake of both. The forms of assistance which presented themselves are considered. There is the direct assistance given to the tuberculous and their families, which is of great value because it is immediately attainable and because in no other way could it be replaced for a large number of cases. There is the possibility that the Corporation, besides training the tuberculous in workshops for suitable employments, might be able to find them employment; in which case, however, their wages would require public supplement. Thirdly, there is the organising of employment, an object immediately attainable, but of itself inadequate. Lastly, there is the question of a colony for the tuberculous and their families, in which they would be under medical supervision, and in which their work would be graduated to their abilities. Such a colony would be limited to selected cases, and would form part only of a general scheme of assistance. Apparently expensive, it would in reality, in all probability, form the most economical solution of the

difficulty, even apart from the prevention of infection. But it would, at the best, entail assistance in the home, as the tuberculous cannot be made self-supporting, and the numbers treated in a colony are necessarily limited.

On a subsequent occasion the question of providing suitable tuberculous patients with houses was mooted, and although the Public Health Committee were sympathetic, the proposal has not matured to action.

At present the economic annual loss to the City from tuberculosis, sustained as it is with the accompaniment of enormous suffering and deterioration, was estimated by me in 1911 to lie between £392,000 and £500,000, and it is evident that it will be worth the while of the City to spend large sums on well-considered schemes for its gradual reduction, even if it cannot be speedily or entirely abolished.

As a small contribution to the same object, it would be of advantage if an instructor in cooking were appointed, whose duty it would be to visit tuberculous families and advise on the best choice of cheap foods, and to show how they might be converted into appetising meals.

In the same report, viz., the Annual Report for 1913, Dr. Sutherland gives a statement of the manner in which Sanatorium benefit was then granted by the Local Insurance Committee, and the different forms of treatment, whether institutional or by practitioners, arranged for and carried out. The procedures, forms, and rules were prescribed by the Local Government Board.

The administration of sanatorium benefit, in so far as carried out by the Local Insurance Committee, entailed a separate staff from that maintained at the tuberculosis office. The Local Insurance Committee took a great interest in the various institutions and procedures, and no doubt acted as a wholesome stimulant.

At an early stage the 6d. allotted to practitioners was diverted from sanatorium benefit and pooled with medical benefit, a procedure which, in the case of Manchester, was not favourable to good administration. That it did not do more harm is due to the good understanding between Dr. Sutherland and the panel Committee, and to their sense of public duty.

When, in 1921, sanatorium benefit was abolished, the administration of institutional benefit was merged in the government by the Local Authority of the various institutions for the treatment of tuberculosis, while domiciliary benefit was merged in medical benefit, but governed still by the forms and rules of the Ministry of Health. The provisions made for the treatment of discharged members of the services suffering from tuberculosis were at first arranged by the Insurance Commissioners in consultation with the Ministry of Pensions, and afterwards by the Ministry of Health still acting in consultation with the Ministry of Pensions.

These cases were entitled to preferential treatment in institutions, so that such treatment was for a time doubly deferred so far as non-insured tuberculous persons are concerned. Were the provision for institutional treatment equal to the need this would not greatly matter, but that is not yet the case. It is, however, very doubtful how far an extension of provision for advanced cases is now desirable, except in the form of a colony.

In the Annual Report for 1913 are given two courses drawn up by Dr. Sutherland for regulation of the daily life of domiciliary cases, according as they are or are not in work, which must have been of great use to practitioners.

We have now reached a point at which two complete services were in operation. In 1912 the Public Health and Treatment Services were equipped and both in operation. But it was evident that any separate administration of the two would be undesirable and wasteful. Fortunately, Dr. Sutherland was originally appointed in connection with public health, and no transition was needful. With the depletion of the offices, moreover, which ensued upon the great war, it became necessary to consolidate the various branches of work, and the entire administration of both branches was put into Dr. Sutherland's hands, acting in association with myself, in the capacity of Administrative Tuberculosis Officer. It was well understood, however, that he was independent of the Medical Officer of Health in his clinical capacity, according to the arrangements laid down in the Departmental Committee's Report. No difficulty ever arose or was even thought of. But it is desirable that the position should be clearly understood.

There are but a few additional points of detail which need recording and are of general interest. In the years that follow, a statement is given on the public health preventive work, separately from the clinical statement, and reports continue to be given of the year's work at the sanatoria, mainly from the professional point of view.

In the report for 1914, Dr. Sutherland calls attention to the danger involved in the examination of sputum for tubercle bacilli. As he observes, there is risk that negative results may be taken as proving the absence of tuberculous disease, on which a single examination throws no light whatever, nor does a single negative result disprove the infectivity of the case. On the other hand, a positive examination gives valuable administrative guidance. It is a caution not to rely on single bacteriological examinations.

Dr. Craig, in 1914, continues his observations on the treatment of cases of pulmonary tuberculosis by artificial pneumothorax. The report on Abergele Sanatorium in 1915 is by Dr. C. E. Warner, who continued treatment by artificial pneumothorax, and introduced heliotherapy into the treatment of the children, having studied Rollier's work.

In 1916, Dr. Sutherland observes: "The attempt has been made to bring to the notice of a large section of the community those symptoms which, being probably due to tuberculosis, should lead them to consult a doctor. This has been done by the issue of a leaflet prepared for the Insurance Committee, who have sent it to the societies for distribution among their members. At the same time a memorandum on the Diagnosis of Tuberculosis was drawn up and sent to medical practitioners. In the preparation of both these documents the suggestions and assistance of the Medical and Panel Committee were freely given and greatly appreciated. It is hoped that by these measures cases of tuberculosis will be discovered at an earlier stage."

In 1917, as in other years, a full statement of the work is given by Dr. Sutherland. In this, as in previous years, he presses for more adequate treatment of children. No unimportant item in his reports is the number of recoveries. Thus, in this year's report, he states that the number of insured patients who have so far recovered that no active signs of disease were found was 228. Recoveries among uninsured persons numbered 368. The report on Abergele Sanatorium is written by Dr. Grant, and deals very fully with the condition of the patients. It lays stress on the instruction of the patients in the personal measures for preventing infection.

In 1918, Dr. Sutherland again returns to the economic aspect of tuberculosis. An improvement is noted as regards the early notification of cases. Dr. Grant gives an interesting study of the changes in weight at different seasons. They may, perhaps, be associated with the amount of green vegetables in the diet.

In 1919, Dr. Sutherland discusses fully both the clinical and the public health aspects of tuberculosis. Dr. R. C. Hutchinson records important steps taken to give employment to the patients. Dr. Grant's report deals with observations on the relation between blood pressure and the improvement of patients.

In 1920, in the course of his report, Dr. Sutherland deals with various factors affecting tuberculosis, notes the unfavourable economic condition of the latter part of the year, touches on the important questions of housing and smoke pollution, and has some very timely observations on the dearness and inefficiency of transport near large towns.

Dr. Hutchinson gives a very full report on Baguley Sanatorium, and advocates colony extension. An enquiry is given into the application of tuberculin to determine the character of doubtful cases of tuberculosis, and the relation of such determination to their subsequent history. He again deals fully with the question of work, and with the need fully to occupy the attention of patients. Dr. Grant, *inter alia*, returns to the study of blood pressure in relation to exercise and improvement.

Such is a brief outline of the efforts which have been made for many years to lower the mortality from pulmonary tuberculosis in Manchester, and to the considerations, which have been forced into prominence by the ascertained facts. This disease, which is probably one of the oldest in the history of living beings, has acquired a position of vantage from which it will be difficult of detachment. It is so destructive of life, happiness, and resources that scarce any effort or combination of efforts would be too great or too expensive, provided that they gave sufficient promise of success. Indirect assault by the amelioration of social conditions being unreliable and tardy, it was necessary to attack directly, to ascertain in what ways the struggle could best be conducted, and to devise the weapons necessary to make it successful.

No speedy termination can be expected, but unless the national resources fail, ultimate success seems certain.

In 1881-85 the standardised death rate from pulmonary tuberculosis in England and Wales was about 2.65 per 1,000 persons living; in Manchester, as now constituted, the crude death rate was about 2.42. In 1920 the death rate for England and Wales was 1.131; in Manchester, 1.17.

In 1881-85 the death rate from non-pulmonary tuberculosis for England and Wales was about 0.65; in 1920, 0.27. For Manchester the non-pulmonary death rate in 1881-85 was 0.58, while in 1920 it was 0.31.

Thus the death rate ascribed to pulmonary tuberculosis throughout England and Wales declined during the last 40 years to about well over one-half of its original amount, while that of Manchester has gone down to little more than one-half. The death rate from other forms of pulmonary disease declined for the whole country to considerably over one-half of its first amount. The relative diminution has not been quite so great for Manchester.

It has to be remembered, however, that in 1881-85 great part of the area covered by the Manchester of 1920 was rural. Moreover, the period of industrial prosperity introduced into the City many unfavourable conditions, which had to be combated at a subsequent period. Nevertheless, Manchester has, relatively to other towns, made decided progress.

The factors in town and country alike which caused the great reduction in the mortality from tuberculosis was growing prosperity, higher wages, lower taxation, facilities for travel, abundance of good and varied food at low prices, diminution of intermarriage, better housing. Many of these are no longer to be had, and the struggle must be continued in their absence. But history and experience alike point to the relief of economic pressure as the most powerful weapon in combating tuberculosis.

TUBERCULOSIS IN BOVINES.

When, in 1882, Koch published his discovery of the tubercle bacillus as the essential cause of tuberculosis, he announced at the same time that a similar, if not identical, micro-organism was responsible for the disease in bovines—in the horse, in monkeys, and many other mammalia. He was evidently of opinion that the tubercle bacillus and tuberculous infection passed freely between one and the other animal. Afterwards, when he produced tuberculin—a liquid obtained by the growth of tubercle bacilli in glycerinised bouillon, and which produced a specific reaction when injected subcutaneously in man or bovines attacked by tuberculosis—the essential identity of the disease in man and in cattle appeared to be confirmed, since tuberculin of human or bovine origin appeared to produce the same results in either.

Accordingly, his announcement at the International Congress on Tuberculosis, held in 1901, that he had arrived at the conclusion that the affection in man and bovines was not identical, and that, in his opinion, bovine tuberculosis was not communicable to man, created much sensation. This inference he drew from his experimental work, in which he failed to convey tuberculosis to bovines by materials obtained from cases of human tuberculosis. Supposing human tuberculosis not communicable to bovines, it does not follow that bovine tuberculosis is not communicable to man, and, in fact, there was strong evidence that bovine tuberculosis was occasionally conveyed to human beings both by the consumption of tuberculous milk and by inoculation. It is not likely that there would be many clear instances, because, between the lodgment of infection and the period when the effects are manifest, is usually a long and also a variable time, during which usually other exposures to tuberculous infection are liable to be interposed, obscuring the evidence. Koch's conclusions were at once disputed, and a Royal Commission was appointed to investigate the relationship between human and bovine tuberculosis. This Commission, which made a preliminary report in 1907, arrived at certain definite conclusions.

It found that there were distinct differences between the growths of tubercle bacilli of bovine and human types on the same media, and that these differences were persistent and unaltered by transference from man to bovine and *vice versa*. Bacilli of human origin, when inoculated in bovines, produced certain changes, but these changes were not fatal, and died out without spreading from one part of the system to another. Bacilli of the bovine type, on the other hand, when transferred to cattle, spread from one part of the system to another, and were ultimately fatal. In man, both types of bacilli produced a spreading and often a fatal affection, as they did also in monkeys and in some experimental animals, such as the guineapig. Their results, therefore, confirmed the results

from which Koch started, but led to the conclusion that while fatal human tuberculosis cannot be conveyed to cattle, bovine tuberculosis can be conveyed to man, and then often caused a fatal type of disease.

Bacilli of the bovine type were found in about one-third of the cases of non-pulmonary tuberculosis examined in man, but were very rarely discovered in cases of pulmonary tuberculosis.

Assuming that bovine tubercle bacilli do not alter their character when transferred to man, the natural inference would be that the human pulmonary tuberculosis is introduced into the human body by another channel than that which serves for the introduction of bovine tubercle bacilli, and tend to the conclusion that, as had been already assumed, bovine tuberculosis is introduced chiefly by the consumption of tuberculous milk.

There were not wanting observers, however, amongst whom Professor Delépine was a protagonist, who maintained that there is no fundamental distinction between bacilli of the human and bovine type, and, as is well known, Professor Delépine claimed that he was able to produce characteristic disease in the bovine by the introduction of a mixture of sputa from different human sources. In his view, there are sufficient variations in the bacilli recoverable from man alone to bridge the differences between the two types of bacilli. This, however, is not the general opinion, and the subsequent course of experimentation left it doubtful whether his mixed sputa may not have contained one containing bacilli of the bovine type.

The conclusions which Koch communicated to the International Congress in 1901 not only conflicted with much evidence which had accumulated as to the communicability of bovine tuberculosis to man, but also appeared to conflict with the results arrived at by the Royal Commissions of 1895 and 1898, and, if correct, rendered futile the whole of the machinery built on the reports of those Commissions. Apart from the official pronouncements, much private effort had also been expended in a contrary direction both in England and France, in which countries the infectious and dangerous character of milk derived from tuberculous udders had become an article of faith to be translated into practice.

Thus, in 1889 and 1890 handbills had been sent to every house in Oldham advising that all milk should be boiled before use—a course of action dictated by the condition of cowsheds and cows from which milk was obtained for use in that town.

The same course of action was pursued in Manchester shortly after I came to this City as Medical Officer of Health.

About the year 1898 a company was started in Manchester for the supply of pure milk on the same lines as those pursued by Mr. Busck in Copenhagen, with much assistance from Dr. Henry, Ashby.

Had this been started on a smaller scale, and the difficulties inherent in the project been first ascertained and surmounted, I still think that the problem of a pure milk supply for Manchester would have been solved, and this was undoubtedly the best way in which the subject could have been dealt with. One of the conditions of that company was that each farmer contracting to supply milk should maintain a herd guaranteed free from tuberculosis. As is well known, this project failed, partly through the magnitude of the scale on which it was started, contrary to the course advised in my first report to the Council in 1894.

In 1896 I made a report to the Council on the facts of tuberculosis, so far as they relate to tuberculosis in cattle, dealing principally with the feasibility of freeing herds of cows from tuberculosis, but incidentally showing the essentially infectious character of tuberculosis both in man and bovines.

The inspection of Manchester cowsheds was at once begun in 1894, and with this was conjoined investigation of cows as regards their power of conveying tuberculosis.

In carrying out these inquiries, I had recourse to the assistance of Mr. James King, M.R.C.V.S., veterinary officer to the Markets Committee, whose reports on the Manchester cowsheds and cows is incorporated in a report made to the Council in 1897.

The condition of the cowsheds as regards both structure and management was at that time deplorable, whether the health of the cattle or the cleanliness of the milk was most to be considered.

In determining the condition of the cows as regards the infective condition of their milk, I had recourse to Professor Delépine, whose studies on this subject were already well known, and without whom it would not have been possible to arrive at satisfactory conclusions. The evidence given before the Royal Commission, whose report was issued in 1895, had shown that the chief danger arising from bovines to man lay in the consumption of tuberculous milk derived from udders affected with tuberculosis. It appeared to me, therefore, that if the Corporation could trace and deal with cows affected with tuberculosis of the udder, it should be possible greatly to reduce the amount of infection from bovines.

As a first step towards this end, Professor Delépine considered it necessary to investigate the condition of tuberculous udders occurring in Manchester, and the circumstances under which they arose.

Mr. James King had ascertained, among the large number of tuberculous cows which he discovered in Manchester cows, 10 which were suffering from tuberculosis of the udder, and these were made the subject of special study by Professor Delépine.

It should be explained that the guineapig is an animal specially susceptible to tuberculous infection, so that by injecting into the guineapig tuberculous milk, treated in a particular manner, the presence of tubercle bacilli could be discovered in many cases not ascertainable by direct microscopic examination. The method of injection had been devised by Professor Delépine so as to give the most delicate and accurate results. This was the more necessary inasmuch as the infected milk from one cow mixed with that from a number of others in a large herd is so attenuated that the infecting bacilli would otherwise be very difficult to discover.

The method of inoculation, however, has this disadvantage as compared with microscopical examination, that the resulting infection in the guineapig takes three weeks or a month to declare itself, while the testimony of microscopical examination is immediate. Moreover, guineapigs are liable from time to time to be attacked by other forms of disease, and the results are then lost.

The object of the preliminary examinations was not merely to ascertain the conditions prevailing in Manchester, but was for the purpose of showing whether milks from cows suffering from extensive tuberculosis other than that affecting the udder were also infective. The conclusion which Professor Delépine arrived at was that they are not infective unless derived from tuberculous udders. At this point it may be mentioned that the procedures adopted for microscopical examination were afterwards so much improved that direct microscopic examination gave positive results in many cases, where originally it was liable to failure, though the test was never nearly so perfect as the method of inoculation.

After these preliminary inquiries 108 samples were taken at random of milks arriving in Manchester from outside farms, of which 20 were shown by Professor Delépine to be tuberculous, or 18.5 per cent, a much higher percentage than would have been obtained from Manchester dairy farms. These samples were derived from 17 farms, of which 16 were visited by Mr. James King, who found on 14 out of the 16 one or more cows suffering from indurated udders. Unfortunately, it was not found possible to obtain samples from the cows under suspicion.

That, however, the percentage of tuberculous cows discoverable by these means was fairly high was shown in subsequent years. Thus, in 1903, it is estimated that 329 station samples covered a total of 6,251

cows, of whom 29 were proved to be suffering from tuberculosis of the udder, or less than .5 per cent. If we estimate the average percentage at 1 to 2, it would appear that there is leakage, the proportion in no year exceeding 0.6. On the other hand, in following up the 45 station samples shown to be tuberculous, 2,537 cows were examined, giving over 1 per cent on the affected farms. It is probable that most of the leakage occurs in the station samples, and that tuberculous udders would have been discovered on direct examination of the farms not primarily incriminated.

In my report to the Sanitary Committee on Manchester cowsheds in 1897, which was accompanied by reports from Professor Delépine and Mr. James King, I have alluded to the elimination of tuberculosis from herds as the goal at which we were aiming, and mention that two herds had been already rendered free. One of these was Mr. Walley's at Tarporley, which was originally rendered free from tuberculosis with a view to secure an advantage in the milk market at Liverpool. This herd was secured for Monsall Hospital in 1896, and with little interruption has continued to supply the Manchester Corporation hospitals down to 1921. This appears to have led to no elimination of tuberculosis in other herds, although there is no doubt whatever that the herd for many years was kept free, and although Mr. Walley has stated on more than one occasion that the procedure is a profitable one—though, apparently, this statement did not take into account the veterinary expenses, which he was spared during the greater part of the period.

About 1902 the Pure Milk Supply Company was given up on financial grounds, and the freedom from tuberculosis supposed to exist on the farms supplying it came to an end at the same time.

In 1897, Professor Delépine had the opportunity of freeing Mr. Gair Ashton's herd from tuberculosis, and afterwards, on more than one occasion, published an account of his experience. He was much interested in the loss sustained, both on this occasion and by the experimental herd of the Cheshire County Council, neither of which, however, take account of the veterinary expenses. The considerable loss resulting was largely fortuitous, but he arrived at conclusions which farmers could have taken advantage of as regards the policy to be adopted. Briefly, it consisted in getting rid of cows for purposes of slaughter should they prove tuberculous while yet young and still valuable as meat; the value of old cows consisting in their milking capacity, while their value as meat is comparatively little. This policy has been partially acted on, under the strong influence of Lieut.-Col. Brittlebank, in the absence of which the tendency has been to kill off the young cows and keep milking cows for a number of years, regardless of the losses sustained by tuberculosis.

It is difficult to understand the persistence of farmers in what looks, on the face of it, a short-sighted policy. Presumably, they calculate up the probable loss of milk sustained by killing cows, even if tuberculous, while still young, and decide to run the risk. It appears to me that they should not be permitted to pursue a policy detrimental to the general welfare, and that rules regulating the age of stock should be laid down by Government.

Following on the inquiries already pursued, the City Council decided to apply to Parliament for power to deal with farmers, outside as well as inside Manchester, on the lines of a Police Act obtained by Glasgow, which, however, had not been applied to districts outside the City. Those clauses gave power to deal with cases of advanced tuberculosis in cattle, as well as with diseased udders. Accordingly, clauses were framed and passed by the Council for insertion in the Local Bill of 1899.

But the clause dealing with advanced cases of tuberculosis was struck out at the town's meeting, and the clause dealing with forms of udder disease other than tuberculosis disappeared when the clauses were remodelled by the Local Government Board.

The principal clauses were left, however, viz., those which gave power to take samples of milk in the City, and, if they were proved to be tuberculous, to go to the farm supplying the milk, examine the cows, and take samples from any suspicious udder for examination. Should the cow prove to be suffering from tuberculosis of the udder, the farmer then came under a clause forbidding him to keep the cow in any field, shed, or other premises along with other cows in milk.

Farmers were also required to notify any cow affected with, or suspected of, or exhibiting signs of tuberculosis of the udder. Should the sample of his milk taken in the City prove to be tuberculous, the Corporation might make an order prohibiting him from supplying milk within the City. But such order was to be forthwith withdrawn if the Corporation or their Medical Officer is satisfied that the milk supply has been changed or that it is not likely to cause tuberculosis in persons residing within the City.

In 1899 a veterinary surgeon was appointed, *inter alia*, to carry out these clauses. The power to make an order was practically not used, as it appeared likely to be harsh in its effects, and perhaps to act unjustly. The procedure was that first mentioned, and even the penalty for failing to notify was not enforced, except in very gross cases.

Tables are given in the Annual Reports showing since the passing of the clauses the number of samples taken at the station, and the proportion of these found tuberculous, also the number of cows with

tuberculous udders discovered. Lieut.-Col. Brittlebank was appointed in 1901, the first veterinary surgeon being Mr. J. S. Lloyd.

Considerable difficulty was experienced in getting satisfactory results. There was reason for thinking that some farmers were informed when station samples were taken, and got rid of their diseased cows before the positive results of the samples entailed a visit. In other cases cows were believed to have been smuggled out of sight.

In some cases, as shown by continuance of infection, cows with tuberculous udders remained for a time undetected, and were only discovered either by development of the disease or by special devices. This occurred in several instances, and threw some light on the occurrence of tuberculous milk without any diseased udder being discovered, which had been supposed to imply that milk might be tuberculous even in the absence of diseased udders.

But the most serious fault was the absence of any power to deal with the cows discovered to have a tuberculous udder. These were, especially in the earlier years, often disposed of to the detriment of other farmers and communities, nor do the clauses give any power to prevent this. It is true Mr. Brittlebank was able, after some years, to establish an influence over farmers which enabled him to get all these cows slaughtered, but that is a purely personal matter.

The proportion of station samples found tuberculous given in the tables already mentioned shows much variation from year to year, and would require an elaborate analysis to explain, if indeed it could be entirely explained. Partly, no doubt, it is due to changes in sampling. But the mode in which it occurs appears to show that this can only occasionally be the explanation. It is probable, I think, that it depends on changes in price and kind of feeding, years in which fodder is dear or green grass not abundant raising the proportion. The udder is a highly-worked organ, and will yield to infection when it is overworked or underfed, or both, and the latter is the variable factor.

There can be no doubt at all about the importance of nutriment. Also the udder will become affected in old cows who have been under abundant production for a number of years, and have not only undergone more exposure to infection, but are physiologically worked out. Of course, another, and perhaps the chief influence, is the amount of tuberculous infection in the herd, which, on the average, is greatest in cows housed in dark and dirty sheds with insufficient cubic space, but may be very high where the evident conditions are not bad.

Another influence of a deleterious nature is persistent in-breeding. A further localised effect is produced by the extent to which, in particular

districts, farmers have come to recognise the value of not retaining aged cows. Probably, however, the most general factor is that of feeding, which affects large areas simultaneously, just as with human beings.

The value of these clauses depends on the skill and enthusiasm of the veterinary surgeon. Professor Delépine was of opinion that, though the reduction in numbers of tuberculous samples was not all that could be wished, yet it could be proved that the affection of the udder was detected in later years at an earlier period than it was at first, so that the amount of infection was much reduced.

Of much importance was the influence exerted by Mr. Brittlebank, who was the means of effecting considerable improvements in the housing of cows, especially in Cheshire. In fact, the milk clauses were also used to enforce his views. Moreover, he was able to modify the practice of many farmers as to the keeping of stock.

It was never expected that these clauses would do more than give a measure of control, or that they could be regarded as a substitute for the elimination of tuberculosis from herds.

The elimination of tuberculosis was shown by Bang, in Denmark, to be a perfectly feasible thing, and was actually carried out on a large number of herds. It was not, however, an easy thing nor an inexpensive one, requires much effort and intelligence to sustain, and, however profitable it may be ultimately, the inducements must be considerable and the farmers' faith considerable. Nor does the difficulty lie chiefly in eradicating tuberculosis. It lies much more in keeping the herd free from tuberculosis once it has been made so. This, however, is not an insuperable difficulty. Bang found quite a number of native herds which were free from tuberculosis because they had never been invaded, an experience which ought to supply valuable hints in practice. The tuberculin test as ordinarily applied has been exposed to doubt, and Professor Delépine worked hard to show that these doubts need not hinder the successful application of the test to its purpose.

Mr. Brittlebank's success with Mr. Walley's herd is a conclusive answer to the doubts which have been expressed. Yet there is no doubt that occasionally active or latent tuberculosis can escape the test for a time, and constant vigilance is necessary. It is this that is the real difficulty, since it is astonishing how quickly tuberculosis can spread through a herd.

The reason for this lies in the habits of cattle. When a cow is suffering from pulmonary tuberculosis she is in the habit of swallowing the matters which she coughs up. The bowel becomes affected, and the dung is highly infectious. Unless great care is exercised, the cow's flanks become plastered with infectious material, and the bacilli, especially

in dark sheds, are diffused through the cowshed. Moreover, the ropy secretions discharged through the nostrils contaminate the space and the food near her, and her neighbours become affected one after another. Notwithstanding that cows occasionally lick each other, the rapidity with which tuberculosis spreads through a herd appears to point to dried and dispersed bacilli as the cause of infection to a greater extent than direct infection in the act of coughing.

The uterus also is very liable to be invaded, and in various ways the disease invades the cowshed and soon spreads.

Hence, although herds can be rendered free from tuberculosis, the condition is one of unstable equilibrium.

It is true that Bang was of opinion that, as a mere question of economy to the agriculturist, it would be a profitable transaction to get rid of tuberculosis, but that is not our chief concern.

Is it necessary for the sake of human infection?

The investigations following Koch's pronouncement may be held to have proved conclusively that bovine tuberculosis is communicated to man, and that human beings suffer from bovine tuberculosis, especially children, and that more particularly owing to the consumption of raw tuberculous milk.

Infection of bovine origin occurs chiefly in non-pulmonary cases, and particularly in children. From the data furnished by our Royal Commission, Cobbett calculates that one-third of the deaths from tuberculosis occurring among children under five years of age are of bovine origin, and that the bovine tuberculosis mortality in man is probably about 6 per cent of the whole. He is of opinion that bovine tuberculosis dies out in human beings at ages above five, and he rejects the view that bovine tubercle bacilli are transformed into the human type. But some of the experimental results of the Royal Commission appear to show that such transmutation may be brought about by successive transmissions. Occasionally, at least, the bacilli in tuberculous sputum prove to be of the bovine type. We must, therefore, ask ourselves the question whether it is safe to disregard bovine infection, and whether, in fact, it may not be a means of renewing the vigour of the human stock of bacilli, which otherwise would decline.

It does not follow, of course, on that account that tuberculosis in cattle need be eradicated. This might, for all practical purposes, be effected if all milk were boiled, sterilised, or efficiently pasteurised.

Moreover, it is held by not a few that, notwithstanding the losses sustained, the struggle of the human frame to overpower bovine infection gives it an advantage in the subsequent encounter with human infection. But this is a very uncertain element.

The course of mortality from tuberculous disease over a long series of years is shown in the following extract from Table E in the Annual Report for 1921 :—

CITY OF MANCHESTER.

TUBERCULOSIS.

ANNUAL RATES OF MORTALITY PER 1,000 PERSONS LIVING.

	1881-1885.	1886-1890.	1891-1895.	1896-1900.	1901-1905.	1906-1910.	1911-1915.	1916-1920.
Tubercular Peritonitis Mesenterica	0.35	0.36	0.22	0.19	0.16	0.14	0.12	0.09
Phthisis	2.42	2.24	2.09	2.04	1.94	1.65	1.59	1.39
Other Tubercular Diseases	0.57	0.59	0.75	0.63	0.55	0.45	0.38	0.28

It is very doubtful how far the consumption of raw milk can be entirely set aside, and on the whole we must assume that the human race would be safer if bovine tuberculosis were got rid of.

What especially moves one is that Mr. Walley, with skilful advice and assistance no doubt, was able to keep his herd free from tuberculosis and make it a paying transaction. It must be owned, however, that the prospects of eradication are not encouraging.

No doubt there could be found men here and there who have the requisite intelligence and determination to carry out and keep carrying out the necessary measures. But it is a matter of character and intelligence. If the attempt is to be made, it can only be done after the establishment of a Veterinary Service adequate to the task. I have explained my views in the *Veterinary Record*, April 25th, 1908, and cannot say more here. But I still think that, both as a matter of economics and public health, the attempt should be made, beginning, however, cautiously, with a careful choice of the right men to lead the van, the choice being guided most of all by character and intelligence.

MILK.

In my first Annual Report for 1894 a brief account is given of an extensive outbreak of diarrhoeal illness in Victoria Park, which was due to milk produced on a farm in Gorton, reported by Dr. Henry Ashby. Examination of the conditions existing at the farm supplying the milk which caused the outbreak revealed a deplorable condition of filth, and occasion was taken in my Annual Report for that year to discuss the question of milk production. The following were put forward as objects to be aimed at:—

1. The removal from the milk supply of all milk from diseased cows, or from cows in an abnormal condition, and the prompt removal from the cowshed of diseased cows.
2. The supply of pure drinking water to the cows.
3. Cleanliness about the farm. The teats and udders of the cows should be carefully cleaned before milking, and milked with washed hands.
4. Adequate space, lighting and ventilation should be provided.
5. The milk pails and vessels should be scalded after each milk round, and carefully cleansed.
6. The milk should be stored on the farm in a dry, well-ventilated, and clean place.
7. When retailed in shops, it should be protected from dust.
8. It should be sterilised before distribution if possible.

In the same report I advocate the founding of a pure milk supply company, on the lines of that conducted by Mr. Busck, of Copenhagen, a project in which Dr. Ashby took a prominent part.

In connection with this I also advocated the conveyance of ^{sterilized} milk in bottles to avoid the various contaminations to which it is otherwise subjected.

Handbills, which in 1894 had been distributed to every house in the City relating respectively to measures of precaution against consumption and diarrhœa, advise that all milk should be boiled before use, and the same advice in connection with tuberculosis had been distributed in Oldham in 1888 and 1891.

In 1894, also, a complete inspection of the Manchester cowsheds was carried out by the Manchester Sanitary Inspectors, and I also made an inspection of them personally. Mr. James King, Veterinary Surgeon to the Markets Committee, subsequently made a description of them, which was given as part of a report to the Sanitary Committee in 1897, but without the addresses of the farms. At least one other description of the farms was made in 1902. These papers have disappeared; it is believed in clearing from the Town Hall to Civic Buildings. The condition of the buildings, however, is to be found in Mr. King's report attached to that of the Medical Officer of Health, but without names or addresses.

The farmsteads in 1897 numbered 95, the number of cowsheds being 185. Of 176 then occupied, 127 had less than 600 cubic feet of air per stall. In a large proportion, light and ventilation were bad, and in many instances the floor was in bad condition, and such that infection was bound to accumulate. In many instances, also, the bedding of the cows was of an injurious character. The provision for storage of manure was utterly bad. The cows were not infrequently dirty. There was, as might be expected, much disease among them. The total number of cows examined by Mr. King was 1,183, and of these he condemned no fewer than 36 as highly tuberculous, although the results of examination of the carcasses is given only for the first 28.

A number of the cowsheds were situated in the centre of the City, especially about the lower part of Cheetham, in Hulme, Chorlton-on-Medlock, etc.—badly constructed and situated.

In dealing with the existing conditions, the first step was to obtain fresh regulations under the Dairies, Cowsheds, and Milkshops Orders, and as far as practicable to reconstruct the buildings. These new regulations were obtained in 1896. They prescribed the minimum cubic space required by the Local Government Board, viz., 600 cubic feet per cow, and introduced two new requirements, viz., that before milking the teats and udders of the cows must be cleaned, and that the hands of milkers in the act of milking must be clean. This is but the beginning of cleanliness, but involves a good deal.

The new regulations, when distributed to farmers, were accompanied by an explanatory statement showing how they might be carried out, and no time was lost in putting them into operation. Already, in 1898, several of the cowsheds had been closed, and in 1903 the number stated to have been closed was 13. After that time the closure of farmsteads was slower, and was due generally to inability on the part of the cow-keeper to carry out the specifications of necessary alterations sent to him. The plans of the reconstructions required were prepared at first by Mr. Story, of the City Surveyor's Department, and Mr. Hyslop, of the Sanitary Department (the specifications by the Medical Officer of Health); afterwards by Mr. J. C. Hudson, C.E., the specifications being drawn up by the Veterinary Surgeon. For a long series of years plans have been prepared by Mr. John Irvine. Gradually specifications were furnished for all the farmsteads in the City, those in the midst of dwellings being gradually closed.

In 1904, however, Withington and Moss Side were incorporated, and in 1909 Gorton and Levenshulme. This entailed the addition on each occasion of a number of new cowsheds to the City Register.

In the Annual Report for 1910, the total number of farmsteads in the enlarged City is given as 121, with 2,000 cows. In 1921 it had dwindled to 73. These farmsteads have gradually disappeared, chiefly because of the advance of house building. This is by no means an advantage, especially after the farms have been renovated, when they can be kept comparatively clean under public supervision—the most important of all considerations. Moreover, the cows in Manchester cowsheds are bought, as a rule, while still comparatively young, and are killed after being milked for a year or two, before they can be much affected by tuberculosis.

At an early stage in the investigations relative to tuberculosis it was found that the amount of tuberculous milk coming from outside far transcended that obtained from cowsheds in the City, and this has continued to be the case, for the reasons given. When all the cowsheds have been driven outside the City we shall, of course, have lost the power to influence the conditions under which milk is produced in them, unless under contract or by purchase of farms.

The principles followed in the earlier emendation of farms are illustrated by two specifications quoted in the Annual Report for 1898. Substantially the same requirements continued to be enforced, with one or two amendments, the most important being a drop of 6 in. from the heelstone to the dung channel, which is considered by Mr. Brittlebank to be an important requirement.

Within the City a strenuous effort has been maintained throughout to secure certain requirements designed to effect cleanliness in the milk and freedom from disease. The farmers were advised to clean the

cowsheds about an hour before milking, so as to allow dust time to settle before the cows were milked. The cows were to be carefully stripped of dung on the haunches when admitted into the herd, and thereafter kept well groomed. The teats were to be kept clean. The cows were to be in separate stalls, with good vessels of earthenware to contain water. In summer farmers were advised to wash instead of merely sweeping the floors. The most difficult thing to enforce was a washbasin with water tap and soap and clean towels for the milkers. Clean smocks for milkers were urged. For many years steady progress was made, but I have never seen dirtier hands than I saw on my visits to farms during the war, and the cleanliness of the udders and cows was not and could not be enforced by the farmers, who had often little or no control over the men whom they employed at that time. The fact is that the great bulk of the cowkeepers have even yet no conviction which would enable them voluntarily to take the necessary measures of cleanliness—the kind of conviction, that is, which results in semi-instinctive action.

In 1898 I drew up advice to farmers outside the City on the management of their cowsheds, which has been steadily supplied since then to those farmer whose milk has been found tuberculous on arrival in the City—advice which was supplemented by Mr. Brittlebank on his visits to the farms. There is no doubt that he succeeded in effecting a great improvement in the earlier days, when dirt could more easily be measured. But the improvement effected in the appearance of milk has not recently been sufficient to prevent the milk turning sour on a long journey, or the development of millions of bacilli in the course of 24 hours.

Dirt in milk is of various kinds. There is coarse, visible, dirt, which was formerly much more abundant; there is invisible dirt, consisting in the presence of micro-organisms in teeming multitudes; thirdly, there is the dirt from diseased udders, which again consists in the presence of multitudes of micro-organisms, causing disease. With the second of these—economically highly important—the farmer either does not know how to deal effectively, or will not take the trouble. He takes out the coarse dirt with a strainer, and thereby thoroughly mixes the invisible dirt with the milk, often adding to the original impurity by a dirty strainer, so giving infection the opportunity to increase more rapidly under favourable conditions. The invisible dirt from diseased udders may or may not have diminished. Probably it generally has.

THE IMPORTANCE OF INVISIBLE DIRT.

Every year, in summer, vast quantities of milk, especially that coming from a distance, turns sour before or soon after arrival at its destination, owing to the multiplication of lactic acid or other bacilli. This entails

a heavy loss on farmers, or on the community, who have ultimately to pay for the loss sustained.

A direct injury to health arises from the multiplication of coli and allied micro-organisms, some of which cause serious and even fatal diarrhoea, and sour milk is injurious to young children. The effective value of milk in the rearing of children is thus very greatly diminished.

The prevention of this class of dirt in milk has been the subject of much research and legislation—at all events, in the United States—and opinion has grown as to the precautions required.

I have mentioned some of the precautions which we have taken or endeavoured to take, not altogether without success. But it is now recognised that these are not sufficient.

The most important factor in rendering milk injurious at the farm is the presence of cows' dung in the cowshed and on the cow herself. Lieut-Col. Brittlebank tells me that he finds it necessary, in order to prevent the spread of tuberculosis in the cowshed, to carry out frequent disinfection by means of a spray of solution of chlorinated lime, not merely in enforcing freedom of a herd from tuberculosis which has been rendered immune or nearly so, but also to check extension of udder disease. Thus, in ordinary herds, further action is required to neutralise the ill effects of the deposit of manure in cowsheds.

Whatever Mr. Buckley may say, maintaining the cleanliness of a herd, and therefore of the milk, necessitates a certain amount of structural efficiency in the cowshed, as well as the presence of a reasonable amount of light and cubic space. It may be added that it is of importance that cows should spend part of the day outside the cowshed, as a matter of health.

Much depends on the manner in which milk is handled in the cowshed and on the farm. Opinion has steadily grown that the safest implement in milking is the human hand. But suitable provision must be made whereby the milker's hands are thoroughly cleansed as often as they are soiled. In the act of milking, micro-organisms are shaken from the milker's clothes into the milk pail, and it is therefore necessary that he should be provided with clean, suitable overalls. We have endeavoured to secure this condition in Manchester cowsheds, but not with much success.

Professor Delépine and Mr. Buckley are of opinion that the number of micro-organisms falling into the milking pail can be greatly reduced by the use of a suitable pail provided with a hood. Theoretically, this is right, and if the farmers can be got or made to provide such pails, so much the better. But comparative freedom of the atmosphere can be secured by the proper cleaning of the cows and cowsheds beforehand,

and, still better, cows can be milked in the fields, as in Denmark, or in a clean shed set apart for this purpose, though every additional precaution is desirable.

A very important condition is the absolute cleanness of milking utensils, both those used in milking and of the churns into which the milk pails are subsequently emptied, and the term "absolute cleanliness" denotes sterilisation. Hence, provision for sterilisation of all utensils should be enforced on all farmers, a requirement which cannot be fulfilled without the means of generating steam. This, although it might appear to bear hardly on the smaller farmer, is imperatively necessary.

Every step in the handling of milk needs consideration, to avoid the introduction of contamination. The milking pail should be emptied into the sterilised churn in some clean place away from the cowshed, unless special measures have been taken to render the atmosphere of the cowshed safe.

Professor Delépine has shown that the use of a strainer may introduce impurity into milk, and, if impurity already exists, will enhance its effects. He has also shown that the Lawrence cooler may add materially to the contamination of milk, by contact of the milk with an infected atmosphere. The processes of straining and the use of the Lawrence cooler should therefore be omitted, unless the latter is protected from atmospheric impurities. The purity of the milk should be attained mainly by the proper handling of the milk before and when it is emptied into the churn, which itself must be sterile.

Professor Delépine has also shown that, if proper precautions, such as are practicable, are taken, milk will keep for a period of 48 hours, even without special measures of cooling.

Nevertheless, if milk, once placed in the churn, could be kept cool until it came into the hands of the consumer, the multiplication of bacteria would be greatly checked, and the injury now done to the child population would be largely diminished. One means available to cool the milk at once is to place the churn in water, wrapt, in warm weather, in cloths communicating with the water, so as to obtain the cold due to evaporation. When so wrapped and properly covered it would be exposed to moving air, as in driving to the station or to town.

All agree that milk should, on the railways, be carried in closed refrigerating vans, and refrigerated on arrival until required for use. If properly handled up to arrival at its destination, it might then with advantage be transferred to sterilised bottles at suitable stations.

The subject is fully dealt with in a report by Professor Delépine, presented to the Manchester Public Health Committee on June 16th, 1918.

The materials necessary for legislation have been fully worked out, and it rests with the Ministry of Health to prepare and enforce regulations which take account of the scientific facts.

The important question of providing refrigerating vans was discussed with the railway companies by the late Alderman Fildes and the Medical Officer of Health, but without any material advantage. The fact is that the farmer is inert, and in spite of prolonged agitation and discussion the general public is little less so.

The necessary measures of reform will have to be formulated and imposed by Government if clean milk is to be obtained. But there should not now be much difficulty in formulating them.

It may be pointed out that if clean milk can be secured, it does not follow that milk free from disease is thereby secured. That is true, but it is only partially true. The measures necessary to secure clean milk, if adequate, will automatically reduce tuberculosis and other diseases.

Important as are the conditions to be observed at the farm, they are not all that is necessary to secure milk which is free from impurities. Occasions have occurred for believing that milk churns in transit may be tampered with, and the milk contaminated.

Then, again, much contamination may occur by the manner in which milk is extracted and delivered from farmers' carts or in the course of the milkdealer's round. This source of contamination was provided for in one way by the Copenhagen Pure Milk Supply Company. The best way to avoid this contamination is to sell milk in bottles, as mentioned in my Report for 1894.

There is reason for supposing that milk is or may be contaminated at large dairies as well as small. Finally, the milk sold in the smaller or mixed milkshops is often exposed to contamination from dust in the shops or dust off the dress of customers. From a very early period we endeavoured to reduce this source of contamination by obliging milk-sellers to keep their milk covered over with a clean plate or with clean muslin. But such protection is obviously not continuous. Again, the best way is to distribute the milk in bottles, which should be compulsory.

Then, again, milk is liable to further contamination from the dirty utensils which we have often found brought for it, and is much exposed by many customers after it reaches the home. Much instruction and training have been bestowed on families on how to handle and keep milk, but, of course, there are many on whom such instruction is wasted.

An objection has been raised to the use of bottles that people often want to buy small quantities. But that need be no barrier, as the smaller quantity could easily be poured from the bottle at the shop without exposing the milk materially to impurity, and, in face of all the dangers

to purity, there can be little doubt that the milk trade should be a bottle trade.

In view of the numerous sources of contamination to which milk is subject, various measures have been advocated. That which I followed was to advise that milk should be scalded on arrival at the house and then covered over till required.

The community is now a well-instructed one, and this course is very largely followed. It leaves the protection of the infant entirely to the mother—not altogether a bad thing. But it is only carried out after milk has undergone a maximum of previous exposure. It kills the infective matter of disease, but it does not secure the milk from going sour. It does not kill all germs. It does protect, however, from attacks of such disease as scarlet fever, enteric fever, and tuberculosis. Every now and again, however, we are sharply reminded, by an outbreak of milk-borne disease, how many there are who do not carry out this precaution.

Another course is to sterilise or pasteurise milk before sale. It is very advisable that such milk should be at once bottled. But even sterilisation does not secure the milk from going bad at times. It is difficult to say to what this is due, whether to faulty sterilisation or to the failure of properly-carried-out sterilisation to ensure the keeping of the milk. The dealer, however, can tell what is amiss, and ought to be able to rectify the errors. If the milk goes bad or sour at once, it was in that condition on arrival. If it goes bad in two or three days after sterilisation, it is probably due to faults in sterilisation. If the milk keeps well for four or five days, and then goes bad, it is probably due to the failure of sterilisation to kill all germs—that is to say, to the initial contamination of the milk. Even then it will not cause tuberculosis. Pasteurisation by the flash method has been shown to be unreliable, in so far as complete destruction of disease germs is concerned. Pasteurisation by the "Holder" method, if properly carried out, not only kills the germs of tuberculosis, but leaves the milk free to cream if desired. Probably this product will generally be that which is most acceptable. Under the conditions of milk production prevailing here, it will not be safe to rely on this pasteurised milk to keep more than a day or two. Personally, I prefer sterilised homogenised milk. But no process will cure milk which is bad to begin with, or render it safe, except as regards the ordinary diseases. Such milk will always be liable, if kept, to produce diarrhoea, or to become unusable.

It will always be necessary, therefore, to insist on strict measures being adopted up to the time when milk undergoes its further protective manipulation. Bearing this in mind, and careful inquiry having been made into the saving in distribution which could be effected, Alderman Jackson laid before the City Council proposals whereby the community

should be its own milkdealer. There were serious difficulties in the way, but there could be no doubt that a well-devised scheme for this purpose would effect economies, and would immensely improve the quality of the milk supply. After considering the various aspects of this proposal, the Sanitary Committee prepared a report which was placed before the Finance Committee, who offered adverse criticism, but only on the ground that it was inexpedient at present to borrow the large sum of money required to carry the scheme into effect.

Nevertheless, the scheme went before the City Council, and was only rejected by a very narrow majority. In favour of a large proposal of this nature is the fact that it would admit of the payment of salaries sufficient to secure good management, which might not be the case for any small scheme.

Still, this need not be a fatal objection to any scheme, provided it was not too small.

There would be some advantages in favour of a scheme which should embrace only municipal purposes, such as the supply of Corporation institutions and of milk required for the Maternity and Child Welfare Scheme. To this might be added the supply of voluntary hospitals if they could be got to agree, as they well might in face of Professor Delépine's report on their milk supplies. It should also be possible to bring in the institutions under the Poor Law. Valuable and not too expensive experience would thus be gained in the handling of a milk business, which would afterwards be of use.

It has been mentioned that, in the year 1918, Professor Delépine presented a report to the City Council dealing exhaustively with the condition of Manchester milk, and also with its history. Apparently, he was inclined to believe that much of the improvement which he had previously shown that milk gradually underwent during the administration of the Milk Clauses was illusory, and was due to the gradual extension of straining and other processes. I do not think that this was wholly the case. Up to the Great War there was, I believe, a gradual but real improvement. Two causes contributed to the deterioration which then occurred. In the earlier years of the war the price of meat was high, and farmers hastened to kill off their young cows. This led to a great increase in the amount of tuberculous milk, owing to the greater age of the cows. In the second place, labour was scarce, and farmers had lost control of their labourers, who were often ignorant and dirty. Even Mr. Walley's herd ceased to be free from tuberculosis, and so rapidly did disease spread that the milk of the whole herd became tuberculous. At the same time the condition of the farmstead got to be neglected and dirty. I found, personally, that the like deterioration was present in Manchester farms, and for the same reason—lack of skilled or controllable labour.

Lieut.-Col. Brittlebank, who exercised considerable influence over farmers was away on service, but I am sure from my personal experience, that his presence would not have prevented the lapse which occurred, though it might to some extent have modified it.

It must in any case be admitted that the general conditions of milk production outside the City have never ceased to be bad as regards cleanliness and disease. Had the City Council accepted the proposals of the Sanitary Committee, and had the distribution of milk outside the City been in the hands of a well-managed administration, there is no question that a great improvement would have occurred in the condition of milk coming into the City, and it is this milk with which we are really concerned. The total number of gallons consumed was estimated in 1917, from figures supplied to me by the Manchester and Salford Milk Dealers' Association, at 33,000 gallons, of which one-ninth was produced in the City—a proportion rapidly diminishing.

In his report, Professor Delépine showed that much of the contamination in milk occurred on the farm, but that it became steadily worse after it left the farm, as might be expected, and at the present time it reaches the consumer, for the most part, in what should be regarded as an unfit state.

What, then, is necessary in order to render this vital food for young children reasonably safe?

Entirely fresh legislation is required, enforcing those requirements which science and experience combine to prove necessary.

The safeguarding of milk may be divided into five phases:—

What happens at the farm ;

What happens in transit ;

Manipulations on arrival ;

Distribution and sale ;

Storage at home and use.

Professor Delépine thus sums up the conditions which he considers necessary at the farm:—

The conditions which promote a dirty state, bacterial contamination and rapid souring are—

Dirty shippens, cows and farm hands ;

Unsterilised, uncovered milk-pails ;

Straining in bulk ;

Cooling at the farm by surface coolers ;

Unsterilised churns of unsuitable construction ;

Non-protection of churns against dirt and heat in transit ;

Unnecessary handling at the town dairies ;

Careless and faulty handling during distribution.

Conditions which promote cleanness of milk—

- Special milking sheds or open-air milking ;
- Clean shippens, cows and farm hands ;
- Sterilised covered milk-pails :
- No handling of milk at the farm beyond transfer from sterilised pail to sterilised churn ;
- Rapid transit from farm to town ;
- Protection of churns against dust and heat in transit ;
- Distribution of milk to consumer with as little handling as possible.

It appears that until such arrangements are available all milk should be boiled at the consumer's house, or sterilised before being distributed.

I would repeat that, in my opinion, all milk should be sold in bottles. This, it will be seen, is the position which I took up in 1894, in the conditions then prevailing, although important conclusions are stated here which had not then been arrived at.

In order, however, that we may reach a sounder position, these directions must be converted into absolute requirements enforceable by law, and with the administration necessary for seeing that they are enforced.

Translated into such requirements, they would run, so far as the farm is concerned :—

1. All cowsheds must be such as regards space, construction, and lighting that they can be kept clean with a reasonable amount of labour.
2. Cowsheds shall be at all times kept clean, except for the dung channels.
3. They shall be thoroughly cleaned out twice a day, and the dung channels shall be swilled out with water and brushed clean.
4. The walls shall be limewashed four times in each year, or otherwise made thoroughly clean.
5. All surfaces which can be reached by dung or splashings of dung shall be disinfected at least four times in each year, and shall be at all times kept clean.
6. At the time of milking, the surfaces of the cows, including udders, shall be free from dirt.
7. The hands of the milkers shall, at the time of milking, be kept clean. For this purpose a supply of clean water, soap, and clean towels shall be available within easy reach of the milkers.
8. The milk-pails shall be covered over so as to prevent dirt falling into milk in the process of milking. Milking shall be carried on either in a clean pasture, or in some covered space having an impermeable floor with provision for easy drainage.

If carried on in the cowshed, special provision must be made to reduce the presence of dust in the air at the times of milking.

9. All milk utensils shall be kept clean, and shall be sterilised before use. For this purpose it will be necessary to provide steam and convenient arrangements for sterilisation.

For small dairies steam can be conveniently provided by means of an oil furnace, and an arrangement devised by Professor Delépine for admission of steam into each milk vessel. After sterilisation the utensils are hung upside down to dry. An installation for small farms is kept on show at Civic Buildings. Sterilisation of lids can be carried out in like manner. The same purpose can be effected more slowly in a small Thresh's machine, which is convenient for smaller utensils. Professor Delépine's appliance was demonstrated to cowkeepers during the war.

Instead of steaming the cans directly, one might use the steam generated to heat water in a tank. After a preliminary washing, it would suffice to plunge the milk vessels into such a tank. But steam has many advantages. Professor Delépine was of opinion that sterilised vessels should be suspended upside down, in which case in larger businesses they could be sterilised *in situ*. He was of opinion that drip shelves were unsuitable as, by capillary action, impurities arose from the shelves into the cans. But this could be guarded against, and such shelves would be more convenient perhaps for cans already sterilised. So soon as the sterilised cans are fairly dry, the lids should be sterilised and placed on them. It should not be difficult to devise means by which these operations could be conveniently carried out.

10. In Professor Delépine's opinion the milk once in the milk pail should be immediately transferred to the sterilised churn, omitting the process of cooling as introducing dirt.

Yet the advantage of cooling is very great in keeping down the multiplication of germs in milk, and it is very desirable, therefore, that railway companies should provide covered and closed refrigerating vans, as is done in countries with such widely different atmospheric conditions as the United States and Denmark.

In a large number—probably the majority—of the farms from which milk is sent to Manchester, the water used is not so cold as to render the effect of a Lawrence cooler very great, and its absence would then be no loss.

Yet a very considerable amount of cooling might be effected in the milk churn, after it had been filled and covered, by placing it in a vat of water with a clean cloth wrapped round it and dipping into the water—preferably of muslin. If the vat or tank is in the open, so much the better. It might further be kept cool on the way to the station from the farm by having it wrapped round with a wet cloth.

Cooling in transit could, of course, much more easily be attained if distribution of the milk supply were in the hands of a large and influential company. However, this cannot be effected at present by a small farmer, or even by a group of small farmers, and all the farmer can do is to see that his milk is put into suitable sealed churns, cooled in a safe manner as far as practicable, and not taken to the station at such a period that it will have to stand about on the railway station.

It would also be a great convenience for smaller dealers, if a cold-air store were provided at the station of arrival, where the milk could be received, cooled down, and poured from one vessel to another if so desired.

Although the ordinary Lawrence cooler as commonly used on the farm is, as Professor Delépine pointed out, a cause of contamination, it may be suitably employed in a large dairy provided that it is covered in and protected from the atmospheric stream.

The conditions now prevailing as regards the conveyance of milk in summer are archaic and scandalous. *All that one can ask of the farmer at present is that his milk is cooled down, if at all, in some safe manner without opening the milk churn.*

The best way to cool the milk is to place the full closed churns in a vat of iced water. Occasionally, near a large clean pond, a farmer may get a supply of ice for the next season by carting the ice off a frozen pond, and storing it, say, under sand, or in the ground and covered over with straw.

When the pure milk supply was founded, ice was supplied to the farmers, and was said to come in very handy for brandy and soda. Any large company could easily supply farmers with ice.

II. It is imperatively necessary that all milk churns should be sealed so that they can only be opened by the consignee. This could easily be arranged with the railway companies.

As regards Railway Companies—

1. Milk should not be allowed to stand at the stations longer than is necessary, or exposed to the sun's rays.

2. Refrigerating vans should require to be provided to a limited extent on all milk-carrying lines, their extension to be determined by the demand.

3. Arrangements should be made such that milk churns are not exposed to dirt or dust.

4. Arrangements should be made with associations of farmers whereby tared, sealed cans are carried without interference with the seal.

5. The decanting of milk on railway platforms should be prohibited.

On arrival it may be assumed that milk is immediately removed and, by the larger dairymen, put in their refrigerating chamber, unless it is

about to be immediately sterilised or pasteurised. A portion will also be sold to shopkeepers. Any such transaction should be carried out in some clean room, and should not take place on a railway platform, nor without suitable precautions.

1. Milk supplied to a shopkeeper from a churn should be taken out in such a manner that bacteria cannot fall into the churn from the clothes of the milk dealer. The churn should be immediately closed again, and the receiving vessel covered over.

2. Preferably all churns should be taken to a refrigerating room, unless the milk dealer possesses one, the milk bottled under suitable precautions, and distributed in such manner as seems best directly to customers or from a dairy or milkshop.

3. After sterilisation or pasteurisation, milk should be collected in such a manner as to be free from contamination, and, if not already in bottles, immediately placed in sterilised bottles provided with a suitable spring stopper.

4. Standards of maximum bacterial impurity should be fixed for—

(a) milk on arrival,

(b) milk after pasteurisation, or sterilisation, and bottling,

(c) when sold to the consumer.

Until this has been done, no further progress in cleanliness is to be looked for.

5. Like standards should apply to milks sold from handcarts, farmers' carts, motor vans, etc., not arriving by rail. In such a case the sample taken for bacteriological purity should be obtained from the delivery churn with all due precautions.

6. It shall be an offence to deliver milk in such a manner as knowingly to expose it to contamination, the delivery of milk to include extraction of milk from a delivery churn or the placing of milk so as to leave it liable to animal interference.

7. When milk has come into the possession of the consignee, it shall be no defence that milk was sour or otherwise below standard on arrival, unless the milk in question has been delivered to him in bottles securely fastened.

8. Every milkdealer or dairyman who has contracted for a supply of milk from any farm or company must satisfy himself by personal inspection as to the condition under which his supply will be produced, and must obtain from the Medical Officer of Health of the county in which his intended source of supply lies, a certificate that the farm in question as regards equipment and sanitation fulfils the conditions imposed by the Cowsheds, Dairies, and Milkshops Orders, and any other conditions imposed by regulations made either by the County Council or by the Ministry of Health.

Some such are the conditions required to stop the present traffic in inferior milk.

It may be anticipated that their fulfilment will entail the suppression of many inferior small farms, and of the sale of milk from many small general shops. That is no necessary consequence, provided the fundamental condition of a clean milk supply is fulfilled.

It has been pointed out that it would prohibit the sale of small quantities of milk from shops. But this does not at all follow, provided such sale of milk takes place from clean bottles properly used.

It has long been recognised that the sale of milk now carried on from general shops should be transferred to suitable dairies, or be replaced by house-to-house delivery. There is, however, no power to prohibit such sale, provided it can be shown that milk is received for sale into clean sterilised vessels, under conditions not inferior to those prevailing in dairies, and undergoes no contamination in excess of that received in well-equipped dairies.

The truth is that the milk business cannot be properly carried on with exposed milk, and that all milk sold in shops, or delivered to houses, should be required to be kept and delivered in bottles with suitable stoppers.

Further, it is advocated that, prior to delivery, milk should be required to be pasteurised in an approved manner, and sold in bottles. Probably this will be the ultimate goal to which the milk trade will arrive.

It appears to me, however, sufficient to lay down conditions which can, as a rule, be only attained if milk is treated in a proper manner. At present we are far enough from this point.

A few remarks may now be made on the Milk and Dairies (Amendment) Act, 1922, the object of which is apparently to improve the conditions under which milk is sold. As will be evident from the above, what I consider should be aimed at is the condition of the milk when sold, rather than the conditions under which it is sold.

Section 2 of the Act gives power to refuse registration of, or remove from the register, retailers of milk. That is to say, it gives power to prohibit under conditions certain premises from being used for the sale of milk. But I do not see that it alters the character of places from which milk may be sold, nor does it alter the conditions or procedure under which such persons may be proceeded against.

It is true a considerable change has been effected and is in progress whereby well-equipped dairies are gradually displacing general shops, and no doubt annual registration may be so used as to further this change. But, as already stated, the essential point is to have pure milk sold from sterilised bottles with spring stoppers, which may easily be so used as to subserve the sale of milk in small quantities without contamination.

ICE CREAM.

The Manufacture and Sale of Ice Cream.

This has been largely in the hands of Italians. An effort was early made to improve the conditions. Ice cream was mostly made in cellars or in kitchens of private houses, and perhaps what one should have done was to aim at entire suppression; and, indeed, this was the interpretation put on the action taken by the ice-cream makers. Most of these places were personally visited, and certain principles were laid down.

The manufacture in kitchens was prohibited, though occasionally boiling only was permitted. As far as practicable, cellars were isolated entirely from the house, and were divided into a boiling and cooling room, arranged according to specification. Instructions were given as to the cleaning of the utensils, and the cleanliness of personal clothing and persons. The surfaces of the cellars were rendered impervious. Arrangements were made, as far as practicable, for ventilation, but this could not be suitably carried out in those parts of the cellars which abutted on streets.

The structural difficulties were not the most serious ones in securing safety for the manufactured article. It was found difficult to prevent such places from being crowded with loungers, whose clothing was, of course, a source of contamination. As a rule it was found practicable to secure apparent cleanliness in the utensils, but if the quantity of boiling water required was considered, it could be inferred that the cleanliness did not amount to sterilisation. Nevertheless, the bacterial contents of these ice creams did not come up to that of ice creams in London West End restaurants.

One or two small ice-cream making places were constructed to specification, and on the whole, dating from 1900 onwards, a considerable improvement was effected. Difficulty was experienced from the fact of frequent changes in site of the place of manufacture.

Ice cream is decidedly a dangerous article of food, particularly if it is made with milk or cream. This arises from the fact that, partly for the sake of economy, partly because of its effect on the final product, the mixture of milk, flour, and sugar is poured into the freezing vessel while still at boiling temperature, and is allowed to cool down slowly to ordinary atmospheric temperature, a process which formerly occurred with the lid off. Any impurity admitted while the milk is still warm has thus an excellent opportunity of multiplying.

Hence, ice cream should either be rapidly cooled, or cooled with the necessary safeguards stringently enforced.

In the year 1900 a considerable outbreak of diarrhoea in Salford was due to ice cream manufactured in Great Ancoats Street. This was traced

at the time to dust blown into the warm pail while standing in the yard, which also contained a pail closet.

Regulations dated February, 1900, give some powers, and establish supervision over these places.

Nevertheless, in 1910, an extensive outbreak of enteric fever was traced to another ice-cream making place. Several manufacturers occupied the premises, and the outbreaks were certainly due to the presence of enteric fever of a mild character in the workers or their families.

In February, 1900, I had already issued full instructions as to the precautions required to be taken in the manufacture. These were now revised and more stringently enforced. But I do not see how any supervision could altogether prevent an accident such as occurred in 1910. I must also again call attention to the utter inadequacy of the staff available to enforce regulations under the Dairies, Cowsheds, and Milkshops Orders, and the Regulations of 1896, which are themselves antiquated, and to properly supervise the manufacture of ice creams—a business requiring both vigilance and intelligence, especially if the instructions drawn up in 1900 and 1910 are properly carried out.

This work is not suitable for the general body of sanitary inspectors, who have plenty of other work to do, and it requires inspectors who are both active and intelligent, and immediately in touch with their superior officer. I strongly recommend that a proper staff should be provided.

ON FOODSTUFFS GENERALLY.

There can be no doubt about the immense importance of foods in the production of a vigorous race, or on the danger of infection from the consumption of contaminated foods. The most important article of food is certainly milk, and the more so that it is practically the exclusive food for infants and children under two years of age, as well as being a principal and even necessary article of diet all through childhood.

How necessary it is that milk should be pure is seen from the numerous derangements which cows' milk is capable of producing in infants when it is not quite fresh, or is used in the form of condensed milk, and from the many outbreaks of sore throat, enteric fever, scarlet fever, diphtheria, and diarrhoea to which it has given rise, not to speak of the attacks of tuberculosis in the young which have been proved to be due to disease in the cow.

But milk is by no means the only article of diet which is capable of producing disease, nor is it the only one the constitution of which is important.

Bread is another even more general food, and may even be more dangerous, as it is consumed after handling, without the possibility of sterilisation. It is capable, when handled by a person suffering from tuberculosis, scarlet fever, enteric fever, or diarrhoea, of receiving and transmitting to the consumers the diseases in question. This is more particularly the case, no doubt, within the household, or at restaurants, etc., and one cannot doubt that infectious disease has very often been transmitted in this way. But it may also be contaminated before its arrival at the house, and is then specially fitted to carry disease.

Many outbreaks of disease have also been traced to the consumption of meat pies, potted and tinned meats, etc., most of which articles in all probability have been infected in the course of manufacture, though in some cases infection has appeared to have been present in meat before manufacture.

It is therefore very important that persons handling foods in restaurants or dealing with the preparation of food, or the cleaning of utensils in restaurant kitchens, confectioners, etc., should not at the time be suffering from open tuberculosis or other forms of transmissible disease. The Ministry of Health has recognised this danger in the case of enteric fever and chronic dysentery, but the still greater danger attaching to open tuberculosis has, as yet, not received official recognition.

The Tuberculosis Order, 1912, seems to prevent sanitary authorities from taking any effective steps to prevent mischief from such persons.

Another precaution which should always be enforced on persons handling food is to require them to wash their hands and dry them on a clean towel after using a closet. It is a perfectly easy thing to enforce if the necessary appliances are provided.

Another precaution which should be enforced is that the preparation of articles of food susceptible to infection should be carried out in reasonably sanitary premises.

Bakehouses.

At my arrival in Manchester in 1894, Dr. Waldo had just published his scathing attack on London underground bakehouses, and no doubt my attention was directed to the subject in that way. At that time the bulk of the baking was in these underground places, the ceilings of which were a little above or a little below the ground. Many of them contained closets. The temperature was so high during and just after baking as to be exhausting. The ovens were of the wagon type, and bread was drawn five or six times a night.

Whenever the wagon was drawn the atmosphere received a copious discharge of sulphurous acid, carbonic acid, and carbon monoxide, and the temperature of the bakehouse rose. Many of the journeymen bakers

were intemperate, and they hastened, so soon as liberated, to refresh their exhausted frames with beer. It is true they appeared to suffer no excessive mortality from phthisis, but it was otherwise as regards bronchitis and pneumonia.

From lifting the heavy 280 lb. sacks of flour, they suffered from flat foot and hernia. Many of them left the occupation while still young, and their mortality would therefore appear under other occupations. Their hours were excessive—from 10 to 14 hours or more.

It was then the custom in a number of cases to lock them in all night, so that, if there was no closet in the bakehouse, the conditions were decidedly worse than if there had been.

The small windows or gaps abutting on the street permitted the entrance of street dust, but there was very little movement of air. The surfaces were uneven, and lodged dirt, which was copiously present under the proving troughs and elsewhere.

The bakers' boots were strewn around, there being, as a rule, no wardrobe or cupboard. Not infrequently the walls were damp, notwithstanding the high temperature, and it was not uncommon to find bread lying against the damp and dirty walls.

The access to the bakehouses might be by a narrow staircase, or occasionally by a trapdoor. The dust from the shop above often passed through into the bakehouse below. Many of them were found to be quite incapable of being rendered fit for the purposes of a bakehouse.

I advised the Sanitary Committee that those which were capable of being amended should be altered to specification, and that the remainder should be closed, a limiting period being allowed within which they should all cease to be used as bakehouses, viz., till 1910, with exceptional cases which might be allowed to be used till 1915.

The subject is fully set forth in the Annual Report for 1894 and subsequent reports, which give the number altered or closed year by year.

The Factories and Workshops Act of 1901 adopted a different course to that mentioned above. It directed that underground bakehouses should be closed unless they could produce a certificate from the sanitary authority of fitness on sanitary grounds. Previously to this Act, in 1895, with the assistance of the City Surveyor, Mr. de Courcy Meade, I prepared a form of specification, which was filled in as suited each case. When the conditions did not appear to justify the issue of a specification, the baker had the option of consulting an architect or a sanitary engineer, and if a specification was sent in which the Medical Officer of Health could accept, the bakehouse was altered accordingly. An approximate figure can be given for the number of underground bakehouses in 1894. In

1902 we find that 110 had been altered and 149 closed. In 1903 the Shop Hours, etc., Sub-Committee visited 119, those being accepted which were certain to receive a certificate in 1904.

There were in use, at the end of 1904, 74, and 76 had been closed during that year, which makes 150 at the beginning of 1904. Prior to this date, 175 had been closed, which gives in all 325 at the beginning of 1894.

This was the hardest piece of individual work one has had to do. Every bakehouse had to be visited and schemes prepared, often for bakehouses which were closed. The hardship to bakers was often great, and sometimes painful.

In preparing schemes, I had the assistance of the City Surveyor and of his assistants, Mr. Lawson, Mr. Story, and Mr. Irvine.

The objects aimed at were the provision of smooth, cleanable surfaces, good approaches, admission of light, ventilation without dust, suitable storage for clothes and boots, means of personal cleanliness, movable furniture for baking. The real difficulty was ventilation, but I found the inverted Tobin an excellent mode of admitting air, provided it was kept clean, and means of extraction could always be found.

The underground bakehouses allowed to pass in 1904, together with those admitted by the addition to the City of Withington, Gorton, and Levenshulme, have steadily dwindled, till in 1922 the total number was only 26.

After the passing of the Factory and Workshop Act, 1901, a new form of specification was prepared and placed before the Council; the underground bakers all received ample notice, and the hardship was lessened as much as possible, though the greatest amelioration of the position came from the large number closed in previous years.

The form of specification used for these remaining bakehouses is given in the Annual Report for 1902.

In the same year I placed before the Sanitary Committee a memorandum on bakehouses dealing with the whole question of their sanitary position.

From the beginning, plans of all NEW bakehouses were sent to the Medical Officer of Health, and the following conditions were insisted upon (Annual Report, 1895):—

The angles of the ceiling of bakehouses to be coved.

Walls to be smooth and such as not to lodge dirt; they should, therefore, be lined internally with cement or closely-fitting glazed bricks.

Attached to the w.c. should be a lavatory basin, so that the bakers may wash their hands after using the closet.

Bakehouses to be effectively ventilated on two external walls by windows therein.

Extraction shafts to be provided in the brickwork adjoining the oven flue.

All walls of bakehouses to be at least 14 in. thick.

Staircase from bakehouse to storeroom above to be enclosed.

The distance between bakehouse and stables to be at least 6 yds

No sink or lavatory to be inside the bakehouse.

Permanent air inlets to be provided in the bakehouse equal in area to the area of the extraction shafts.

Examination of these plans enabled us to suggest improvements from time to time, and some of the above requirements were modified.

A lavatory basin inside the bakehouse was found to be a useful addition. It was originally excluded on account of the tendency to splashing. After a few years it was found necessary to accept a lesser thickness of wall than 14 in. This was inserted because of the tendency of bakehouse walls to crack, but good ventilation obviates this tendency.

I prefer sash windows or French windows to those which came after a time to be provided, viz., fixed windows with louvre movable sashes at the top. Windows are required in bakehouses in summer which allow free movement of air, and, therefore, in addition to the top louvre portion, the lower parts of the window should be made to open freely. Amongst the points on which one tried to insist were, clothes cupboards ventilated to the outer air, and the provision of dining rooms.

RESTAURANT KITCHENS.

In 1914 I requested Dr. McClure to undertake the amendment of restaurant kitchens. Of these there were about 350 in the City. In the Report for 1914 it is stated that "attention has been given particularly to the premises of pork dealers, where the preparation of tripe, sausages, meat pies, and so forth is carried on in the basement under unsuitable conditions. Apart from routine inspection, 18 such premises have been dealt with, and alterations according to the specification sent out by the Medical Officer of Health have been completed in 11, and are in progress in 7."

In the Annual Report for 1915 Dr. McClure reports on the work done in foodshops in connection with army contracts. He states that 204 premises were dealt with. Of these, 110 were considered satisfactory, 63 were badly defective, and in 31 defects of a less serious nature were noted.

In the case of premises badly defective, a specification of the work required was prepared in accordance with the suggestions of the Medical Officer of Health, and sent to those concerned. As a result, 47 premises have been altered satisfactorily, some of them being entirely rebuilt, and in seven the conditions have been improved. He pays a just tribute to Mr. Higginbotham, whose services I found most valuable.

He also reports that in the middle of 1914 a systematic investigation into the condition of restaurant kitchens was begun. "Fifty-nine have been visited by Dr. McClure, and specifications of the work required to make them suitable for the business have been served upon the owners and tenants."

The records of these visits, plans and specifications are in the Office.

Much work was carried on in connection with army contracts, and a statement of the specifications carried out is kept by Mr. John Irvine, by whom the specifications were drawn up, and plans prepared in accordance with the views of the Medical Officer of Health.

Brief particulars are also given in the Annual Reports.

It might be supposed that it would be much more difficult to get work carried out in restaurant kitchens than in bakehouses, but there appears to be ample power in the Public Health Act, 1875, for dealing with the former.

Much work was carried out under the army contracts, and so great was the improvement effected, that it appears desirable to continue the systematic inspection and improvement of all workplaces or workshops in which food is prepared. I wish to acknowledge the valuable assistance given to me by Inspector Higginbotham in this connection.

As will be seen from the annual reports, a fair beginning has already been made in this direction. But this work might with advantage be systematically pursued.

The object to be attained is to establish such conditions that cleanliness is made easy, both as regards atmospheric conditions and materials used.

CONTAMINATION OF FOOD: BACTERIAL FOOD POISONING.

This is a serious and insidious form of poisoning, which is probably not uncommon. The occurrence of food poisoning usually comes to the knowledge of the Medical Officer of Health too late for him to be able to secure any samples of the materials by which it has been caused. Frequently it is confined to one family, and often the nature of the occurrence is not suspected. Occasionally, however, poisoning is more

extensive, and then it is generally possible to secure the suspected materials for examination. No doubt, many deaths due to food poisoning have been put down to other causes, and recent experience shows that the danger is not diminishing. Numerous outbreaks are on record of food poisonings on a considerable scale.

They are either of animal or mineral origin. Those of animal origin appear to be far the most common, and have generally been found in association with one of the coli group of micro-organisms, and more particularly with the presence in food of organisms of the *bacillus enteritidis* (Gaertner) variety, which causes a violent and painful illness, resulting now and then in death.

One of the best known is that which occurred in Derby in 1902, and which was described by Dr. William J. Howarth, then Medical Officer of Health, the bacteriology being worked out by Professor Delépine. Poisoning was due to a batch of pork pies cooked on September 2nd, 1902, and was found by Dr. Howarth to have caused illness, mostly severe, in 221 persons—131 within the County Borough, and 90 outside. There were four deaths. Dr. Howarth and Professor Delépine both made very exhaustive investigations from different standpoints, and Professor Delépine's is marked by even more than his usual acumen and thoroughness. He remarks that the occurrence and the conditions which he found call for thorough measures, both structural and personal. The business needs a degree of personal care, similar to that demanded by the business of a cowkeeper, and which it seems equally little likely to receive.

Nevertheless, something we have done, especially since the outbreak of the Great War, in improving conditions in the pork butchers' business, and in indicating the measures necessary, as my previous observations will show.

But there are still not a few premises which need overhauling, and what is of no less importance, there is still much room for intensive instruction of the workpeople.

In Dr. Howarth's outbreak, the invasion by the *bacillus enteritidis* was believed to have been proved to be due to contamination of chopped meat by material from the bowels of pigs, removed in the process of cleaning, before the chopped meat was converted into pies.

A striking feature was the rapidity with which the pies became completely and thoroughly invaded. It was shown that the temperature to which they were exposed in baking was probably insufficient to kill the bacillus, a defect which should be easy of amendment. This rapidity of growth of the coli-organisms occurs in an equally striking manner in the living body when invaded by coli-organisms after death.

German experiences appear to have been much more frequently due to disease in the living animal before slaughter, and there seems to be no doubt that the results are alike, whether contamination occurs before or after slaughter, owing, no doubt, to the rapidity with which this bacillus grows in dead tissues.

A much rarer, but even more formidable, cause of disease is the *bacillus botulinus*, which manufactures a particularly virulent form of poison in the meat which it invades. It is found especially in association with pork, and usually exacts a high fatality. No cases are known to have occurred here.

We have had remarkably few experiences of this sort in Manchester, and these of a very limited character. One of these was investigated by Dr. J. R. Hutchinson, who was unable, however, to obtain material sufficient to fix the cause. A very limited but fatal outbreak is mentioned by Dr. McClure, in the Annual Report for 1920, in which the bacillus of Gaertner was found in the bodies of two victims, but the material causing the disease had disappeared.

Perhaps the most striking instance of food poisoning of bacterial origin occurring in Manchester was one reported upon in October, 1913, which occurred at a pork butcher's establishment at 721, Ashton Old Road. This was investigated and reported on by Dr. McClure, and in part investigated also by Dr. Cunningham. A recent striking occurrence was investigated by Dr. W. A. Young.

In the course of the former, 163 persons were affected, and three died. Various parts of the pigs were concerned in the outbreak, belly, shoulders, neck, feet, leg, savoury duck, sausages, and other foods. The portions which caused poisoning were often sold while still warm from cooking. The bellies implicated were said to have even boiled for four hours. In the same copper were boiled, after the bellies, different materials which had been in pickle in the cellar for a considerable time, varying from some days to weeks. All the materials sold appear to have been concerned.

So far as one could ascertain, not only were the premises defective, but proper precautions had not been observed in handling the materials. Numerous specimens were submitted by Dr. McClure to Professor Delépine from the persons who died, and from other persons who had suffered—blood, fæces, urine, etc.

A Gaertner bacillus was isolated from the organs of all the fatal cases; also from three specimens of fæces of other persons affected. The material submitted from the shop consisted of part of a pig's cheek, which had

been left in connection with one of the cases, but no organism was isolated from this.

The conclusion arrived at was that the outbreak was probably due to contamination after handling the materials in which the pigs' bellies had been cleaned, or surfaces contaminated before boiling.

One satisfaction obtained in this case was that the premises were thoroughly renovated, and the butcher duly warned of the risks which attended failure to take adequate personal and other precautions.

The rapidity with which contamination invaded the various materials is very striking, including, it will be remembered, material which had been kept in pickle for a fortnight.

It is, however, open to suppose that between receipt of the bellies and their boiling, a number of materials had already been contaminated.

One interesting feature of the outbreak was that Dr. Cunningham ascertained that five babies belonging to women attacked were taken ill with diarrhoea, apparently due to the consumption of breast milk.

The second considerable case is that occurring between May 21st and May 25th, 1922.

Twenty-five individuals were affected, in one case with a fatal result.

The material concerned was frozen mutton, though, in addition, persons suffered from the consumption of veal, doubtless as the result of contamination at the same shop.

This was a very exhaustive and thorough investigation, and it was conclusively shown that the invading organism was a *bacillus suispestifer* (Aertrycke) type mutton. The public health investigation was carried out by Dr. W. A. Young, and the bacteriological investigation by Dr. G. D. Dawson.

It was not found possible to decide with absolute certainty whether the organism concerned was present during the life of the animal responsible, although a pure culture was obtained from the bone marrow of the joint which caused the fatal case. Here, again, the complete invasion of veal with the contaminating organism is notable.

This investigation leaves nothing to be desired in point of thoroughness either from the public health or the bacteriological standpoint.

Consideration of the reports which we possess serves to emphasise :—

1. The desirability of cases of food poisoning being made notifiable immediately on their occurrence, or, on their being suspected by a medical practitioner to have occurred, if necessary materials for investigation are to be secured.

2. The need which exists that all food-preparing establishments (including in the term food, drinks, other than water, and food accessories, such as baking-powders) should be subject to periodic inspection under the direction of the Medical Officer of Health.

3. The need for all places concerned in the cooking of joints or other animal foods, or in the manufacture or cooking of pies, sausages, potted meat, brawn, blood puddings, etc., to be so constructed, arranged, and administered as to offer reasonable protection against contamination.

4. That measures should be taken to secure that a sterilising temperature is reached in baking meat pies, etc., and in the preparation of potted meats, etc., intended for sale.

5. That the storage and cleaning of bowels should be carried out apart from any premises in which the cooking of foods liable to contamination is carried on, and by different persons.

6. That after handling bowels no person should take part in the handling or preparation of foods, unless he has first washed and disinfected his hands, and otherwise rendered himself free from infection.

7. That printed and verbal instructions should be given, under the directions of the Medical Officer of Health, to persons engaged in the preparation, cooking, or sale of articles of food which have been shown by experience to be liable to cause food poisoning.

CHEMICAL FOOD POISONING.

Our experience of poisoning with chemicals is more extensive than that with bacteria or their products, and it will easily be understood that the above observations with regard to notification apply even more fully, as any delay may mean losing the materials or evidence necessary for a satisfactory conclusion.

Our first experience of mineral poisoning was the tremendous outbreak of arsenical poisoning in beer drinkers, which began in the middle of 1900, and ceased, so far as fresh poisoning was concerned, early in 1901, but not by any means so far as the fatal consequences were concerned.

Dr. C. H. Tattersall, then Medical Officer of Health for Salford, was informed by Dr. Cran, of that County Borough, that he had a very large number of patients suffering from what appeared to be alcoholic peripheral neuritis. He obtained samples of beer from public houses supplied by 14 different breweries, sent them for analysis, and proceeded to make enquiries into the cases, of which Dr. Cran had given him a list.

The particulars which Dr. Tattersall collected made him very anxious to have the matter investigated, and, as the Public Analyst had failed

to detect either mineral or other contamination, on November 16th he requested Professor Delépine to undertake the enquiry.

On November 20th, Dr. E. S. Reynolds called at the Manchester Public Health Office and informed me that he had had under his care for six months a great number of patients suffering from peripheral neuritis, some of whom were deeply pigmented, and many of whom had suffered from various eruptions and affections of the skin. These patients had been seen both at Crumpsall Infirmary and at the Royal Infirmary, and he had had ample opportunity to give them a complete study. What led him in the end to suspect arsenical poisoning was the frequent occurrence of herpetic eruptions, and the different symptoms observed then cohered into a well-known syndrome. On testing the beer which these patients had been consuming, he had no difficulty in showing by the Reinsch test, that they contained arsenic in amounts easy of detection. Professor Delépine was also informed of his discovery.

I at once visited the Crumpsall Infirmary and saw a number of the cases, as well as the Withington Infirmary, which also contained a number of cases.

Through Dr. Reynolds' courtesy I obtained the addresses of a number of patients, and of the public-houses at which they had been accustomed to drink beer. Twelve samples were forthwith taken at these public-houses, and were submitted to the City Analyst, who was at the same time informed that he might expect to find arsenic in the beer. He was unable to find any, and was of opinion that none was present.

Meanwhile, on November 23rd, Professor Delépine discovered arsenic in a sample of glucose from a brewery in Salford, submitted by Dr. Tattersall on November 22nd, who thereupon visited the works at Garston, Liverpool (Messrs. Bostock's), from which the arsenicated glucose had been purchased, and obtained samples of all the material used. He also visited at Leeds, Messrs. Nicholsons, the sulphuric acid makers from whom Messrs. Bostocks had obtained their acid for converting starch into sugar, and cane sugar into invert.

It was then found that the sugars manufactured by Messrs. Bostock were introducing large amounts of arsenic into the beers brewed with them, and warning was immediately given to brewing firms and publicans.

When it was clear that Manchester was in the same position as Salford, I also applied to Professor Delépine, who declined, however, to take on the Manchester investigation, as he had enough to do with Salford.

There was no help for it but to make such examinations as we could ourselves. Professor Delépine showed me how he conducted his application of the Reinsch test to give a quantitative estimate of the quantity of arsenic in beer. Dr. Coates and Dr. McCleary, my Assistant Medical

Officers, carried out inquiries outside, and I carried on the investigations inside with Mr. R. M. Rowe, who took the chemical work, while I did the microscopic examinations.

Mr. Rowe destroyed the organic matter in the beer with carefully tested sulphuric acid, and applied the Marsh test to obtain mirrors, at the same time that he was able to show that only a little arsenic was lost in the charred residue. In this way a double estimate was obtained in a number of instances of the amount of arsenic present.

After his visit to Messrs. Bostocks, Dr. Tattersall supplied me with a list of 13 breweries in Manchester who had purchased sugars from Messrs. Bostock, and from these the materials used by them were obtained and examined.

A circular sent to medical practitioners was very generally answered, and from their answers and from information obtained from the Union Hospitals, we were able to determine the public-houses from which arsenicated beer was being sold. A large number of samples was collected, and examinations made, of which a statement is given in my report.

Meanwhile, owing to initial difficulties, Dr. Tattersall had obtained a clear start with his investigations. Reports are available by Dr. Tattersall with Professor Delépine and by myself, and there is, moreover, the report of the Royal Commission which followed.

A few figures only need be given. I quote from Dr. Tattersall, who gives an excellent account of the outbreak: "Analysis by Professor Dixon showed that the sulphuric acid obtained from Messrs. Bostocks' works showed that apart from the precipitate deposited from it, it contained at least 1.45 per cent of white arsenic.

"Analysis of other samples by Dr. Campbell Brown, of Liverpool, and Mr. T. A. Reid, of Liverpool, give the total amount of arsenic present in this sulphuric acid as at least 2 per cent."

This would more than account for the largest amount found in Messrs. Bostocks' glucose, viz., .095 per cent, and this again would account for at least two grains per gallon.

This, however, is on variable hypotheses. I calculated from Professor Dixon's analysis that, assuming three-quarters of the arsenic to be taken out in the filters, and that 20 per cent of the malt in a brew, by weight, was replaced by glucose, and not allowing for any subsequent addition of invert, allowing also for removal of one-fifth of the arsenic by yeast, there would remain from .28 to .56 grains of arsenic per gallon. It is, however, doubtful whether the filters were burned after each time of use, in which case the amount of arsenic sent through might be three or four times as large.

The largest amount of arsenic found in any beer by Professor Delépine was $1\frac{1}{2}$ grains per gallon. The largest amount which I obtained was about $\frac{1}{2}$ grain per gallon, though out of 27 samples analysed in the Office there were four which gave $\frac{1}{3}$ grain or more.

No doubt the arsenicated glucose was mainly responsible, but, on investigating other materials, malt was by no means freed from suspicion, and in the absence of proper precautions was quite capable of causing poisoning.

It was at that time not altogether unusual for men to consume two gallons of beer a day, and even $\frac{1}{30}$ grain per gallon might under such circumstances cause disease and death. At the same time it was well ascertained that a glass or two daily of the beer then used was capable of causing poisoning.

A striking feature of the cases was the slowness of recovery, as indeed might have been expected from the great wasting of the muscles. The small muscles were especially affected, and whether from this cause or from some effect on the female, the birthrate in 1901 showed a marked decline, very strikingly in the second and third quarters of the year, and equally well marked in Manchester, Salford, and Liverpool.

Death was principally due immediately to heart failure, though sometimes to paralysis and hypostatic pneumonia.

Assuming that the deaths more directly to be ascribed to arsenical poisoning would appear under the heads peripheral and other neuritis, alcoholism, cirrhosis of the liver, other liver disease, gastritis (in adults), the average number of deaths annually from these causes in 1896-99 was 227, while the number in 1900 was 340, so that we may set down 113 deaths to arsenical poisoning in 1900.

From facts given in the Annual Report for 1901, it would appear that at least 62 deaths occurred in the first half of the year from peripheral neuritis, arsenical poisoning, chronic alcoholism, and cirrhosis of the liver—more than the average for the years used for comparison, which are not themselves free from suspicion.

If, then, the number of deaths from arsenical poisoning be put for the two years at 200, it will not be much, if at all, overstated. From returns by medical practitioners and Union returns, I estimated the total number of cases known to be affected at 2,000.

Dr. Reynolds had 25 deaths out of 700 cases, and applying this mortality to the estimated number of deaths we get a total of 5,600 cases, slight and severe. This is probably a nearer estimate of the number affected, if the steep and temporary fall in the birth rate in 1901 be taken into consideration.

Dr. Tattersall makes a grand total of 107 deaths in Salford up to the end of January, 1901, probably due to arsenical poisoning from beer, which would bring his total death rate well over that in Manchester.

Out of 115 deaths ascribed to arsenical poisoning, Dr. Tattersall found that 28 were males and 87 females. There can be no doubt that hard physical work enables men to get rid of arsenic to a great extent. Nevertheless, the amount of beer drinking amongst women is rather appalling. A reference to Dr. Reynolds' paper on the clinical features of the disease may be interesting. (*Lancet*, January 19th, 1901.)

In our reports on the outbreak of arsenical poisoning through contaminated beer, both Dr. Tattersall and I have remarked on the singular fact that in spite of the numerous cases presenting new and striking features which were occurring for months in the Union Hospitals, we neither of us received any intimation that anything unusual was going on, and this notwithstanding the fact that these institutions were under instruction from the Local Government Board to give the Medical Officer of Health timely warning of any unusual outbreak of disease. When I add that this has been equally my experience as regards such obvious dangers as an increase of influenza, it will be seen that the machinery of Government is much at fault so far as the utilisation of information from Union Hospitals is concerned. The great importance of such early intimations of exceptional disease is too evident to need insistence. But it is not so clear how the fault is to be remedied. The treatment of disease by the Poor Law is, of course, an anomaly, and the only defence that could be made on its behalf is that money can be got by the Poor Law Authorities from the ratepayer for the treatment of disease which might not be so easy to procure otherwise.

Anyhow, an effective means of utilising the knowledge available in the Union Hospitals, which is paid for by the public for the benefit of the public health generally, ought to be devised by the Ministry of Health in such a form that lack of information should not occur.

On the other hand, the fault does not all lie on one side. The machinery for obtaining weekly statistics should be so utilised as not to become mere matter of routine, and any striking increase of any special form of disease should, at all events, be made manifest by watchful examination of the death registers. The tendency to glide into routine is always present in the Public Health Office as elsewhere.

In the Annual Report for 1908 an outbreak of arsenical poisoning by sweets was reported upon by Dr. J. R. Hutchinson, who gives an admirable account of the investigation.

The number of children affected was 62, and the sweets were of two kinds—one hard and brown, the other smaller and sticky. They were sold either in separate boxes or mixed.

Only the smaller sticky sweet contained arsenic. On an average these sweets contained $\frac{1}{20}$ grain of arsenic. They were obviously made at a different time and with different materials from the other sweets. Judging from the character of the sweets, Professor Delépine was of opinion that they were not made according to the manufacturer's formula, and from their composition he was of opinion that they were made with badly-contaminated glucose. In fact, he thought that it was a "try on."

Supposing them to have been made with glucose only, of an excessively contaminated character, it may have been possible for the amount of arsenic in them to have been introduced. The amount of arsenic was far in excess of anything found at the time of the beer poisoning. The children were nearly all sick, either directly or within an hour or two, and rapidly recovered.

The source of contamination could not be traced, a fortnight having elapsed between the making of the sweets and the notification to the Medical Officer of Health of the occurrence.

The complete recovery of the children, and the absence of any after effects, was a very striking feature of this outbreak.

The third occurrence of mineral poisoning occurred in 1918, and was due to self-raising flour manufactured in Manchester. A full summary is given in my Annual Report for 1918. The firm had wide ramifications, and the self-raising flour was used for a great variety of purposes. Some 300 cases of acute poisoning were traced, and the Government analyses show that tartrate of antimony was present in large amount. We received valuable assistance from the Ministry of Health in the investigation of this outbreak.

Professor Delépine may be assumed to have proved that, in the process of mixing the self-raising flour, tartrate of antimony was introduced with the acid phosphate ingredient into the flour mill, but whether at the time of mixing the flour, or in the process of manufacturing the acid phosphate, was not proved. Samples and scrapings taken from the kegs which had held the acid phosphate failed to show any trace of antimony.

A notable circumstance was that the manufacturer of the acid phosphate was at once notified by the maker of the self-raising flour when the poisoning occurred. The acid phosphate was bought marked "unguaranteed," and a very high brokerage was paid on the consignment. It cannot be said that anyone concerned came out of the transaction with flying colours. No proof was obtained on the premises of the manufacturer of the acid phosphate of the presence of contamination with antimony, but then he had had ample warning. I had most valuable assistance from Inspector Higginbotham in the investigation of this outbreak, and, of course, from Professor Delépine.

The illnesses produced were marked by burning sensation in the throat, vomiting, pain in the stomach, acute thirst, severe and repeated diarrhœa, and severe depression. The attacks came on from half an hour to an hour and a half after the contaminated food was consumed.

Needless to say, immediate steps were taken to stop the sale of all flour which had been sent out, both in Manchester and elsewhere. No deaths occurred.

The flour recalled was subsequently allowed to be reissued, each bag undergoing a simple test for the presence of antimony, which Mr. Higginbotham carried out for me, and only bags shown to be free from antimony being issued.

It is a pity that no one was punished for this occurrence, as it appears almost necessary that an example should be made. It is a still greater pity that we were not able to fix the chief culprit.

These repeated outbreaks show that the danger still exists of extensive occurrences of food poisoning by means of mineral ingredients used in the preparation of foodstuffs.

On the last of these occasions punishment could have been inflicted through the Sale of Food and Drugs Acts, which perhaps would have been the best way, as a prosecution would bring out all the facts, so far as they could be ascertained.

SELECTION OF FOODS.

Another matter of the highest importance to the population is the selection of foods. In my first Annual Report for 1894, I advocated that instruction as regards the selection of diets should be given by the School Board, and that the construction of diets should be given as part of that instruction—of course, only to senior pupils. With the knowledge then available, and with the aid of analyses of foodstuffs, it was possible to so arrange foods that they could be put together so as to yield the necessary amount of proteids, starches, fats, and salts which should enter into the daily diet, and it was proposed that senior pupils should be instructed in the construction of diets in this manner, such instruction being in itself a useful exercise in the use of figures.

Later on the Sanitary Committee approached the School Board with a view to their giving a course of instruction to senior girls in the management and dieting of infants. My proposal was that selected teachers should be instructed, and should then give a course to their senior girls, the necessary instruction being gradually extended to the teachers found willing and able to undertake it. What difficulties this may have entailed I do not know. But some years afterwards, at the

instance of Dr. R. W. Marsden, the School Board again considered the subject, and appointed Miss Grace Taylor to give a course to senior girls, going from one school to another. No selection could have been better, but the course pursued was not calculated fully to achieve the object aimed at. The number of special teachers—if special teachers there must be—should have been commensurate with the proposal.

At the first National Conference on Infantile Mortality I advocated again the giving of an adequate course to senior girls in elementary hygiene, with special reference to the rearing of infants, by teachers practically trained for the purpose.

I was aware that Dr. A. Brown Ritchie gives a course of theoretical instruction to teachers, with the aid of lantern slides, but I did not then, and do not now, consider that this is all that is required. (See paper in question.)

In 1902, having carried out, with the aid of the health visitors of the Manchester and Salford Ladies' Health Society, inquiries into the social condition of the population, I returned to the subject of choice of foods and construction of diets in a paper given as part of a University course at the Public Health Laboratory, entitled "Food and Drink in Relation to Disease" (published by Sherratt and Hughes, 1902), which gave material whereby a cheap but suitable dietary could be selected, and showed how such dietaries might be constructed.

The conclusions there given need to be amended in the light of the knowledge recently acquired as regards vitamins. But the additions to the dietary thus entailed need not materially increase the expense, which is, of course, much greater now than it was then.

In 1914 the Sanitary Committee caused a summary of this paper, entitled "Information for Social Workers on Food Values and Feeding," to be widely distributed.

In January, 1920, was issued to the health visitors a leaflet giving sufficient information about vitamins to enable them to instruct mothers as to the necessary additions to be made to the diet of their children and to their own. (Annual Report, 1920, page 89.)

I have here made only those observations which may be necessary to ensure that the vital subject of public instruction as to foods and dietaries is not lost sight of, and I would commend it to your earnest consideration.

By a judicious choice of cheap though adequate foods, and by adequate instruction in cooking, great economies in health and wealth may be achieved.

Above all, the colossal and wasteful expenditure on alcohol ought to be avoided.

In my Annual Report for 1903, I show to what an extent the necessary diet falls short in a considerable section of the poorest citizens, and with what seemingly disastrous accompaniments.

SOME OBSERVATIONS ON HOUSING IN MANCHESTER.

When Mr. John Leigh was appointed Medical Officer of Health in 1868, the area covered by the City was 4,293 acres, and it embraced the following sanitary districts: Ancoats, Central, Cheetham, St. George's, Chorlton-on-Medlock, Hulme, Ardwick, and Beswick.

In 1885, Harpurhey, Bradford, and Rusholme were added, and the area increased to 5,933 acres.

In 1890 a number of outlying townships were incorporated, viz.: Blackley, Moston, Newton, Clayton, Openshaw, Kirkmanshulme, and West Gorton, raising the area to 12,911 acres.

In 1904 the districts of Withington and Moss Side were added; when the area of the City became 19,059 acres.

Finally, on the addition of the districts of Gorton and Levenshulme, in 1909, the area rose to 20,799 acres.

An interesting map is in the possession of the Public Health Office which shows the expansion of the City at successive periods—from a small village in 1650, to its growth in 1880, the successive intermediate periods outlined being 1741, 1751, 1772, 1794 and 1831.

Mr. Leigh incorporated in his successive annual reports maps exhibiting Manchester as constituted in 1871, and showing the houses built from 1830 onwards, from which it is seen that the greater part of Hulme was built prior to the first set of building byelaws in 1868.

But Mr. Leigh also gives a series of enlarged maps for many enumeration areas, showing not only the classification of the buildings, but also discriminating the dates at which the houses were built. There is a set of ordnance sheets also in possession of the Public Health Office, dated 1888, showing very clearly the houses and their arrangement up to that time—a set of maps which are valuable for future reference and comparison with more recent changes.

The extensive operations of the Housing Sub-Committee up to the present time and the alterations to closets are exhibited on maps in the possession of Mr. John Irvine, the Housing Manager, which show also the conversions from pail closets and middens to water closets so far as carried out under his supervision.

Moreover, Mr. Irvine has separate plans for each of the housing alterations carried out by the Sanitary Committee from 1885 onwards, kept along with the original plans of the houses before the alterations were effected.

Another set of plans in possession of the Sanitary Superintendent shows the alterations to closets carried out by the Sanitary Department, marked on as they occurred. If it were thought desirable to show a complete plan of closet alterations, these would have to be shown on the same plan as those carried out under Mr. Irvine's supervision, from which they are quite distinct.

Finally, there is an excellent map photographed from the ordnance sheets in 1918.

There are thus abundance of maps for studying the former and present condition of the City, especially if the numbers of alterations carried out are at the same time followed from the Annual Reports of the Medical Officer of Health.

As I have stated, the first set of building byelaws was obtained in 1868. They are most imperfect and, *inter alia*, do not require that houses should be provided with a damp-proof course.

They do require that every dwelling-house shall have directly attached thereto, and for the sole and separate use thereof, an open yard containing a clear superficial area (exclusive of the buildings which may be erected on the space referred to in the foregoing byelaws numbered seven) of at the least 70 square feet.

Scanty as this space is, it is sufficient to differentiate between the older houses and those built after these byelaws came into force.

Every room must be 9 ft. in height, and every room used as a dwelling or sleeping room must have an aggregate window area of not less than 10 square feet.

Every new street must be at least 30 ft. wide, the width being varied according to the height of the buildings.

Thus, notwithstanding the defective character of the byelaws, some check was imposed on the tendency to cram as many dwellings as could be schemed out into a given space.

The next set of building byelaws in 1890 brought no material improvement as regards streets. But every house must now possess a space attached to the rear of not less than 150 square feet, and must have a damp-proof course.

The building byelaws of 1908 require a space attached to dwellings of not less than 250 square feet. Unfortunately, these came into force just before the slump in building set in. But, at all events, these require-

ments serve to demarcate building into distinct zones, more especially so far as the older portions of the City are concerned.

Manchester is a city of cottage dwellings, the prevailing type being the four, five, or six-roomed house. Houses, therefore, cover a large area in proportion to the number of persons to an acre, as the tenement dwelling has found no acceptance and no home outside the centre of this City. One effect of the mode in which recent cottages have been erected is to produce an aspect of dreary monotony, though the effect on health is probably not bad in other respects. There is, broadly speaking, no bath in the smaller houses built prior to the war.

In the older parts of the City the houses in 1894 were very crowded on the site. There were many closed courts, and narrow recesses lined with back-to-back houses, containing usually two rooms—one up and one down. There was, usually, in back-to-back houses, very little movement of air, and the privies stood in stacks in the courts, or between houses, or at the ends of a row of houses. Often they were in a filthy condition, having been kicked open, whether they were in a street or in a court. An abomination in themselves, in association with back-to-back houses they made life indecent, injuring health in more ways than one.

When Mr. Leigh became Medical Officer of Health, the first step of his Committee was to abolish cellar dwellings, which were then, however, only about 2,500 in number. Prior to his time, the inhabitants he thought might be described as cavedwellers.

The Housing Sub-Committee constituted in 1885, with Alderman Walton Smith as chairman, were of opinion that their first duty was to do away with back-to-back houses—then about 10,000 in number, housing perhaps 35,000 people. There could be no doubt about it, whatever might be the merits or demerits of back-to-back houses in the abstract, the back-to-back houses of Manchester were unthinkable.

They could, however, only be pulled down, or by partial demolitions made into through houses with yards and water closets, and Dr. Tatham, with the City Surveyor, schemed out a plan by which the change could be brought about, although it seems evident from his report that he had grave doubts about the fitness of existing back-to-back houses to undergo and repay the expense bestowed upon their alteration.

Alternative plans were submitted, and these did not all sufficiently take into account the need for movement of air through the dwelling. Indeed, even after experience in dealing with back-to-back houses had been acquired, it was not always easy to obtain satisfactory alterations. It was also apparently found impossible to carry out these alterations and provide, at the same time, more light and dampproof courses, and these considerations may have inspired Dr. Tatham to utter his caution regarding the fitness in structure of these dwellings to sustain alterations.

At the same time, in 1889, Dr. Tatham made an official representation in respect of an area in Oldham Road (covering two areas numbered 1 and 2), which, after due formalities, was cleared of houses. The number of houses demolished was 239, and the number of persons displaced 1,250. He also made at the same time a representation in respect of an area off Pollard Street, Ancoats, on which 88 back-to-back houses were demolished, with displacement of 396 persons.

On the Area No. 2, Oldham Road, and on the Pollard Street area, tenement dwellings of five stories were erected, designed by Messrs. Spalding and Cross, London.

Besides these, several smaller areas were condemned at the same time, and, on the demolition of the houses, were left as open spaces.

In 1891, Dr. Tatham made a representation in respect of the Chester Street area, in Hulme, on which 133 houses were demolished, with displacement of 368 persons.

In the same year, also, he made a representation in respect of the Pott Street area, Ancoats, on which 127 houses were demolished, with displacement of 399 persons.

In 1891 the Sanitary Committee acquired certain condemned property in Harrison Street and Providence Street, Ancoats, this area being extended in 1896.

The model common lodging-house, "Walton House," was afterwards erected on this site, the number of cubicles provided being 363. A new wing was subsequently added, raising the total number to 467. This lodging-house was built on the model of the Rowton Houses in London, and was intended to serve as the pioneer of other houses which should replace the faulty common lodging-houses then existing in Manchester. It was named "Walton House" as a memorial of the great interest taken in its construction by Alderman Walton Smith. Much care was expended on its equipment to render it healthy and convenient to the inmates, but no comparable improvement in the character of common lodging-houses generally ensued.

At the same time (March 17th, 1897) that plans were passed by the Council for its erection, plans were passed for the erection of dwellings on Oldham Road, Area No. 1, the Chester Street and the Pott Street areas.

In 1899-1900 the Corporation acquired what is known as the Blackley Estate, consisting of some 237 acres, with a view to provide houses for persons of the working class displaced by improvement schemes or otherwise, and also to provide allotments. In 1903, Mr. Henry Price submitted plans for the first instalment of houses on this estate to the number of 203.

In 1903, in connection with the widening of Rochdale Road, it was arranged that a block of tenement dwellings should be erected on a site lying between Rochdale Road and Sudell Street, to the number of 64, to house 224 persons.

The tenements first erected were on Area No. 2, Oldham Road, and were in five storeys. They came in for much criticism, which in most respects was unjustified. It is a fact, however, that common closets and common sinks were provided for each two adjoining dwellings, an arrangement sure to give rise to strife and heartburning, and in itself objectionable. Further, no common lift was provided—almost a necessity for aged or weak people living at the top of the dwellings. Probably most of the unpopularity attaching to the dwellings was due to these causes. Anyhow, the prejudice was so great that it became impossible to provide any further lofty buildings. The tenements erected in Sudell Street in 1904, in fulfilment of requirements of the Education Committee, were designed by Mr. Henry Price, and were much more convenient, but it was not considered wise to go above three storeys. The dwellings erected on Oldham Road, Block No. 1, consisted of cottages and tenements on two storeys, and have given much greater satisfaction to occupants than the adjoining tenements. Only the block facing Oldham Road was of three storeys, the ground floor being occupied by shops,

The two-storeyed tenements provided at Barrack Street, Hulme, in 1911, were erected with a view to make provision for persons displaced by the operations of the Education Committee, and partially displaced dwellings unfit for human habitation. The occasion for these dwellings was the same as that which had given immediate occasion to those erected on Oldham Road, Block No. 1, and at Sudell Street.

These schemes are described in a volume, with plans, issued by the Sanitary Committee in 1904. It is now incomplete, and a complete edition is urgently called for.

An important and much-contested addition to the above was the erection, in Long Millgate, of "Ashton House," for a common lodging-house for women, which has served a useful purpose, though financially it has not been a success owing to the small number of cubicles which it contains, viz., 210. It was opened in September, 1910, and was named after Miss Ashton in honour of her advocacy of proper provision for women of the poorer class in need of decent lodging.

A tabular statement of the accommodation afforded by the housing schemes mentioned above up to 1904 is given on page 43 of the book issued in that year by the Sanitary Committee. It does not, of course, include the dwellings erected on the Barrack Street site. Up to that year provision had been made in new dwellings for 4,629 persons.

With the exception of the acquisition of the Blackley Estate, it cannot be said that these were much more than experimental contributions to the question of housing, although they did away with a few of the worst areas. Taking into account the vast area of insanitary houses and streets in the centre of Manchester, they cannot be called extensive improvements.

A large scattered area of badly-arranged, insanitary dwellings already covered the present City in 1870, and no small portion dated as far back as 1830, as will be seen on consulting the maps given by Mr. Leigh in his reports.

In order to make the sweeping away of insanitary areas an adequate measure, it would have been necessary to take a large area, in fact the whole of that part of the City which was built prior to 1870, and divide it into adjoining areas approximately equal in population. In that case the dislocation produced by the demolition of houses might have been minimised, one complete clearance serving for the series; the inhabitants of each area in its turn being provided for in the houses last erected, as has been done in Liverpool.

The City Council was certainly not prepared for expenditure on that scale. Moreover, it was a question whether the reconstruction of areas quite near the centre of the City was a desirable measure. Each period of prosperity creates a demand for business premises of the warehouse class and offices near the centre, and reconstructions too near the centre are liable to interfere with this natural process.

On the other hand, in 1894, scattered all over the more central districts, was a great number of back-to-back houses, many of them in narrow streets or courts, deficient in light and ventilation, with pail or midden-closets close to the door, and so built that, without reconstruction, no decent arrangement was possible; without damp-proof courses, and frequently damp, surrounded with foul soil—the results of choked or defective drains—the ground sunk into pits, many of them served in common by water-taps outside the house near middens or pail-closets, or in a narrow and malodorous passage behind the house.

On a consideration of the conditions, it appeared to be the best course to deal first with the 10,000 back-to-back houses existing: to condemn these and have them demolished or, when possible, partially demolished, thus providing through houses, movement of air, and attached yards and water closets.

This, accordingly, was the course pursued, and, poor as the result must often appear, the conditions left were a vast improvement on those already existing.

It is to be remembered that *pari passu* with the alteration of the houses went the provision of paved yards, the reconstruction of drains, and the provision of water closets, and this important result followed

the operations of the Housing and Unhealthy Dwellings Sub-Committee, whether relating to back-to-back or other houses.

When this task was fairly complete, the Housing Sub-Committee proceeded to deal with those houses which were unfit for habitation because they were placed too near together, or because in other ways there was obstruction to the entrance of light or to the movement of air. Often this arose from the placing of houses across the ends of long rows of houses, which were often crowded together at the back. Perhaps sculleries and bedrooms were thrown across the narrow spaces between adjoining rows of houses, or in other ways there was obstruction to the entrance of light and movement of air. As far as practicable, it was the task of the Housing Sub-Committee to condemn houses presenting those features, and, besides removing the worst features by schemes which aimed at more movement of air and admission of light, to provide good yards and passages, water closets and drainage, each house receiving a separate yard and water closet.

The conditions existing in the city so late as 1904 are described by Mr. T. R. Marr, in his book on housing conditions in Manchester and Salford, which gives a detailed and full statement of the conditions then prevailing. They are also reported upon in the annual reports of the Medical Officer of Health. Mr. Marr afterwards acted as Chairman of the Housing Sub-Committee for a number of years of strenuous activity, during part of which period the Housing Sub-Committee met every week.

Many useful schemes were carried through in his time, and the fundamental requirements of light, cleanliness, and increased movement of air were provided where most required, with the minimum of disturbance.

The houses dealt with were certified to the Corporation by the Inspector of Nuisances as unfit for human habitation, and the subsequent proceedings were taken under the Manchester Corporation and Waterworks and Improvement Act, 1867. But the houses certified were also visited by the Housing and Unhealthy Dwellings Sub-Committee, accompanied by the Medical Officer of Health, the Sanitary Superintendent and Mr. Irvine, before being brought before a meeting of the Sub-Committee.

The owner of houses so certified was then invited to appear before the meeting of the Unhealthy Dwellings Sub-Committee dealing with his houses, to make any statement to the Sub-Committee he might think fit as to why the house certified should not be closed. If his representation was not found satisfactory, the Sub-Committee passed a resolution that the Sanitary Committee be recommended to make an order that the buildings shall be closed, and that after the expiration of 28 days from the passing of the order the buildings shall not be inhabited.

In most cases plans of alterations were agreed upon between the owner, the City Surveyor, and the Medical Officer of Health before the order could take effect. These were submitted to a meeting of the Sub-Committee, and, if the Sub-Committee accepted the plan, an intimation was given that, on the completion of the alterations, the order would be withdrawn.

The procedure was subsequently varied. At the meeting Mr. Irvine submitted plans of alterations, when the owner was heard, by which the houses could best and most economically be altered, and if these were agreed to the order was made, but its issue suspended until the owner should have an opportunity to carry out the scheme agreed. The character of the alterations carried out may be seen in the small publication of the Sanitary Committee, dated June 23rd, 1908, which gives plans of several blocks as they were before and after reconstruction.

The following summary is given in the Annual Report on the Health of Manchester for 1920 of the work carried out under this procedure from 1885 to 1920 :—

Houses certified and ordered to be closed.	Number added together or to other houses.	Number demolished.	Number repaired and reopened.	Number closed.	Number not closed.	Number which stand adjourned.
27,317	3,409	6,746	13,395	1,350	2,308	109

The degree of activity shown will be seen from the following table :—

Year	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
Houses ordered to be closed	63	115	139	219	300	202	358	720	675
Year	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.
Houses ordered to be closed	904	930	782	441	506	859	399	132	545
Year	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.
Houses ordered to be closed	545	717	576	558	2,710	2,239	2,188	1,834	2,327
Year	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.
Houses ordered to be closed	2,247	1,398	801	618	216	10	4	7	0

It will be seen that the closing of insanitary dwellings underwent many fluctuations. It may be divided into two periods—that mainly of back-to-back houses down to 1906, and that of larger operations involving the opening out of streets in various ways. It was, of course, dependent for its success on the building of new houses, either in Manchester or in its environs.

In periods of prosperity, building operations were very active. They had not only to provide for the limited closing of houses carried out by the Sanitary Committee, but also for the demolition of houses in order to provide buildings for advancing trade and for street improvements.

Alderman Walton Smith, when Chairman of the Sanitary Committee, considered that the piecemeal operations of the Unhealthy Dwellings Sub-Committee resulted in only a limited local displacement, which exercised an outward pressure, and led to increased building and a steady movement of pressure outwards. In order to diminish the inconvenience sustained by the closing of houses, care was taken to distribute the Committee's operations so that the stress should be distributed as widely as possible at any given time.

That Alderman Walton Smith was right appears to be shown by the successive decline at three census enumerations in the number of persons per house, and I have also shown in my Annual Reports that there was no increase in density per house as the result of these operations.

But, of course, this is only possible if building is actively proceeding, and if new houses are not erected operations of the above character cannot proceed.

It is of vital moment for the renovation of Central Manchester that building schemes should proceed rapidly. From a very early period the Sanitary Committee realised that the success of their housing procedure depended on making not only houses, but also facilities for transit available on the outskirts of the City, and in 1898 the Sanitary Committee presented to the City Council a carefully-prepared report on workmen's cheap trains and trams, while every effort was made to secure them. At present all persons may receive cheap return tramfares before 7 a.m., and reduced railway fares are available to workmen before 8 a.m.

The number of new houses erected in successive years is shown in the following table :—

NEW HOUSES.

Year	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
Houses erected	682	1,093	669	777	1,083	1,974	2,206	2,743
Year	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
Houses erected	2,712	2,308	1,686	1,744	1,561	1,652	1,475	1,720
Year	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
Houses erected	2,062	1,666	1,608	1,269	866	524	517	374

From 1914 onwards the building of new houses rapidly declined. The above figures relate only to the City as constituted before Withington, Moss Side, Levenshulme, and Gorton were added, in order to give an idea of how new building proceeded over one large area. It will be seen that a great wave of building occurred between 1894 and 1901, and a smaller between 1905 and 1910. In the former, especially, the number of new houses provided considerably exceeded the demand created by increase of population, and probably also by other alterations, and it was this surplus of building which made possible the operations of the Unhealthy Dwellings Sub-Committee.

If, now, we add the houses built in Withington and Moss Side, we find that this surplus was sustained up to 1911:—

EXTENDED MANCHESTER.—NEW HOUSES.

Year	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
Houses erected ..	2,204	2,500	2,634	2,249	2,344	2,256	1,578	1,072	997

The total number of houses subsequently erected was:—

Year.....	1914.	1915.	1916.	1917.	1918.	1919.	1920.
Houses erected..	748	410	119	19	..	..	79

The increase in population from 1911 to 1921 was 27,000, as shown by the census figures. The number of houses built was 5,022, which, at the rate of 4.6 persons per house, would accommodate 23,101 persons.

Yet it is quite certain that this gives no measure of the number of houses required. Not to mention the houses pulled down for works, no inconsiderable number have become uninhabitable. Moreover, large sections of houses in the City are quite unfit for habitation. The number of families has greatly increased, and large numbers can find no separate home.

What, then, has been the result of all the labour expended by the Unhealthy Dwellings Sub-Committee. In my opinion it has been immense. It could not convert a squalid, crowded, conglomeration of ugly, old, and worn-out houses into a healthy town. But it has cleared away the worst features. It has opened the way for light and air to enter where these were most needed. On the other hand, the alteration in dwellings has been the least part of these changes. The soil has been redrained and relieved of impurities by the abolition of the pail-closet and midden privy systems. The surfaces were levelled and repaved, and much of the dampness afflicting the houses was thus removed.

Nevertheless, over considerable areas the houses are getting worse. The mortar is perishing, the roofs are decaying, the walls are riddled with vermin, there is not enough light for healthy life. These houses should go, not one by one, but in areas.

It must be admitted that the difficulties are very great. It is, first of all, essential that a large number of new houses should be erected. Modern views of housing in cottages demand, not, indeed, a commodious or sumptuous dwelling, but arrangements for a supply of hot water, a bathroom, storage of provisions, etc. There must be ample air space around the house, and room for a small garden. The number of houses must not exceed from 12 to 16 to the acre.

A garden would be of comparatively little advantage unless the atmosphere were comparatively free from smoke, so that these new dwellings should, as far as practicable, be removed from the smoke-laden air, or this air itself purified from smoke.

Another demand immediately arises. If such cottages are to be available for the worker, he must have cheap transit to and from his work. Indeed, this is the most imperative need of all.

Moreover, his wages must be sufficient to enable him to live in these improved dwellings. All these improvements have to be paid for, and cannot be had without a tax being levied on someone. It is admittedly necessary, and the best workmen are eager to take advantage of the new buildings provided, but the tax has to be paid largely by those who can ill afford it. Must it fall either on income tax or on rates?

On the other side of the account, at present, is the tax now levied on the industry of the City by the impossibility of finding homes for the people who should make way for the extension of business, the tax raised by the great amount of sickness and disability which still prevails, and has to be paid for either in State-aided or voluntary institutions, and the huge tax in inefficiency produced by the housing conditions in Central Manchester.

The immediate and urgent matter is to get on with the building of houses.

In one respect, the dwellings erected by the Corporation, whether as rehousing schemes on condemned areas, or in order to meet the needs of education, had a great merit in so far that they endeavoured to vary the type of house so as to meet the wants of a variety of tenants. At all events, that was the case after the first essay in the Oldham Road, No. 2 area, tenements. The State-aided schemes have the same merit, though the favourite type is a small house, doubtless because the tenants are mostly young married people and can afford to pay the rent.

Private building of cottages appears for the time to have been extinguished, and the State has accepted the obligation to provide

houses for the working classes assisted out of Imperial funds. As the price of their assistance they demand conditions of site and type which are an immense advance on past conditions.

It was, perhaps, imperfectly realised how large an obligation was being incurred. In any case, the provision of these improved cottages is, in effect, so far almost restricted to discharged soldiers, and the situation is as yet only slightly improved by the example of a better state of things.

But, as has been said, the State-aided houses are few in number, viz., 3,500; they are almost restricted to discharged service men, who are mostly young, and recently married, and can therefore live in them without overcrowding. They are all engaged long before they are built, and numerous persons continue to apply, who would be hosts if there were not a notice put up to say that the houses are all let. Their occupancy so far gives but little relief. They are taken by people who flee from overcrowded conditions. The general body of the people are little better off than they were before. If there were new houses of these types available, most persons could not pay the rents—12s. 6d., 15s., 19s., and 23s.

Can anything be done immediately to meet the needs of those who dwell in the dark and worn-out houses of Old Manchester? Regard must be had, of course, to a reasonable economy. It would not be either economical or just to plant houses in the path of mercantile advance. Any schemes of rehousing must be in those parts of the City which will not be needed for business purposes for a long time. Displacements would have to be in small sections and in series. But, this being said, there seems no other way of securing light and air in central districts for the requisite number of people than to house them in tenements. This cannot be done economically, and the community would have to pay part of the price of erecting the tenements required.

One question needs to be asked. Can we not resolve to follow the example of America and go dry? Can there be any doubt that the liquor trade paralyses the hands of the social reformer and keeps the people poor?

There has just been a great exhibition and conference in Manchester on town planning, and the town planning schemes for South and North Manchester—the former in course of completion, the latter awaiting resuscitation—will, no doubt, exert a great influence on the future of the City. If the present conditions of the population in the central areas are to be taken in hand, it would seem to be necessary that a town-planning scheme—at least, its main arteries—should be laid out for these also, so as to prevent any schemes of rehousing from being a hindrance to future progress. If so, such a scheme should be made a

matter of urgency, since it is daily becoming more necessary to deal with the poorer parts of the population in the older parts of the City.

In Dr. John Robertson's little book on "Housing and the Public Health" will be found a useful statement of the newer outlook in housing developments, and he gives a brief account of recent legislation.

The framers of recent legislation in regard to housing have had in mind two principles: one that the standard of housing in the new schemes, which local authorities are obliged to make, shall be of a higher character than in the past, and shall make full provision for movement of air, abundance of light, and ample space around houses; the other, that the development of populous areas shall proceed according to plans which shall secure the best development for transport, location of industries, and the various allocation of open spaces to secure the greatest possible amenity and benefit to growing communities. It is self-evident that these aims will best be obtained if the populous centres clustered around Manchester can combine to make their main roads and town-planning arrangements fit one into the other. It must, therefore, be regarded as a great achievement to have induced over 100 sanitary authorities within 15 miles of Manchester to join together with that object, to be effected through the Manchester and District Joint Town-planning Advisory Committee, with advisory functions, but in reality with considerable influence to produce the co-ordination aimed at. It seems advisable here to mention this important movement.

But, in the present condition of trade and wages, these schemes for the amelioration of the future leave untouched the pressing problems of the present, and they cannot safely be left so. If, indeed, adequate houses could be erected at low rents, it might be safe to trust to the future, but not so long as houses cannot be erected at rents which the tenants cannot now pay and have no immediate prospect of paying.

It needs no imagination to realise that the present situation is fraught with danger to the social structure. The present conditions of housing in the older parts of Manchester belong to a past epoch of history, and are rapidly becoming unfit for any period. The new future Manchester planned out for a better civilisation, when every man shall possess a living wage, does not belong to the present economical epoch, and is not now a remedy. It requires supplementing. Just at present the poor are not becoming better off. If their needs are to be met consistently with the erection of habitable houses, this can only be done by the demolition of the worn-out houses and the erection of tenements, or by the erection of suitable dwellings on the outskirts. In any case, we must face a loss in those which have already been built, as they must presently depreciate in value.

Amongst the minor earlier operations of the Housing and Unhealthy Dwellings Sub-Committee of the Sanitary Committee was the demolition of limited areas of unhealthy dwellings, and the provision of small open spaces.

These are or ought to be great boons to the public, and these limited operations at all events should be renewed, where practicable.

But the open spaces provided should, I think, be restricted to the use of mothers or girls in charge of infants and small children, and enclosures and shelters of a cheap character should be provided. They should be regarded as sun-spaces, and should be large enough to allow of the free movement of air. Older children should be restricted to school or other definite playgrounds and parks, and should not invade these refuges, which are not large enough, and in any case ought not, to be playgrounds.

MATERNITY AND CHILD WELFARE.

Although isolated efforts had been made to improve the health of school children, the attention of the nation was first seriously drawn to the need for strenuous action by the investigations of Dr. W. Leslie Mackenzie into the physical conditions of Edinburgh school children, and the corresponding investigation by Dr. Matthew Hay for Aberdeen, published in the Report of the Royal Commission on Physical Training (Scotland), 1903. The serious character and extent of the defects then revealed shocked and alarmed all thoughtful people, and led to the establishment of a School Medical Service in 1907, the full usefulness of which will become more manifest as time goes on.

This feeling of alarm led to the appointment of the Interdepartmental Committee on Physical Deterioration, which reported on 1904, and whose report still further assisted in bringing about improvements.

It followed from the revelations in regard to school children that attention was at once directed on all hands to the condition of children under school age, and in 1906 a conference on infantile mortality was convened under the presidency of Mr. John Burns to consider what steps should be taken to deal with the causes of the high infantile mortality then prevailing. The subject was renewed at successive conferences. But meanwhile the Chief Medical Officer to the Local Government Board, Sir Arthur Newsholme, K.C.B., was directing his attention to the subject, and in a succession of able reports issued by the Local Government Board, he investigated the causes of the high mortality prevailing.

The efforts to deal with the high infantile mortality took various shapes :—

1. The establishment of a system of health visiting, which I found in 1894 existing in Manchester in a form which could be, and was, gradually adapted to the purposes of maternal instruction in the care of infants.

2. One of the early institutions was the milk depot, first established at St. Helens and afterwards on a great scale at Liverpool. Dr. G. F. McCleary, formerly on the staff of the Public Health Office, also established a milk depot at Battersea, and has given an account of the movement, initiated in France and Belgium, in an admirable little book.

3. A movement was initiated in Manchester for the instruction of senior girls in elementary practical hygiene, and in the care of young children.

4. The Children Act, 1908, set forth provisions to give young children protection against parental neglect, although this was only extension of previous legislation.

5. In 1908 a large number of Manchester ladies formed a guild, afterwards called the School for Mothers, having for its object the care of children, which they aimed at in two ways by the establishment of clinics to which poor mothers might bring their children for medical advice, and at which also mothers might receive lessons in elementary hygiene, making up garments, cooking, and in other ways.

6. In the year 1902 was passed the Midwives Act, and in 1905 the Corporation appointed a committee to carry out the Act so far as it concerned the Corporation, and to administer the rules framed under the Act. Of this committee Dr. A. W. Chapman was chairman, and fortunately a very capable lady doctor, Dr. Margaret Merry Smith, was appointed as Executive Officer. Her able successors were Dr. Barbara Cunningham and Dr. M. Douglas, under whose guidance the department successfully evolved.

7. No small part of the struggle has consisted in (a) establishing that the housefly is the principal cause of the summer, or rather the autumn, uprush of diarrhoea, and (b) in efforts to prevent the development of flies, especially in relation to horse manure.

8. The widespread education of the public through leaflets distributed by the Registrars of Births and Deaths and otherwise, conducted since 1894.

9. Maternity consultations, venereal disease consultations and treatment, massage of children suffering from rickets, malnutrition, infantile paralysis, etc. These are later developments of the Maternity and Child Welfare Centres taken over from the School for Mothers.

10. The Public Health Department, with the assistance of the School for Mothers, rendered valuable service in feeding mothers and children

in the distressed period 1915-16. More lately, initiated by the School for Mothers, aid has been given first by the School for Mothers, then by the Corporation, finally under an Order of the Local Government Board, to infants and later on to mothers unable to pay for milk, in cases recommended by the medical officers carrying on the work, and after careful investigation of the circumstances of those assisted.

11. Lastly, it should be said that the Local Government Board (now the Ministry of Health) have pressed on the appointment of a large staff of health visitors. Perhaps that is fortunate. But though large for the office accommodation available, it is not large enough for the duties imposed on it.

12. The visiting of cases of measles and whooping cough is a valuable part of the work, and a material element in the reduction of infantile mortality.

Such are some of the contributions to a reduction of infantile mortality. But I should not like to admit that I am satisfied.

1. The staff of health visitors is inadequate. The attention demanded by young children in Manchester is, on the average, far greater than that needed except in similar industrial centres. The number of those requiring frequent visits is larger, and though something may be done by readjustment, experience shows that we do not have enough of the children under sufficient supervision, especially in the first two years.

2. No organic refuse should be deposited within the City. It is probable that it would be a real immediate economy if destructors were used and, if need be, erected on the Cleansing Department's stations at suitable points, and with attached areas so mapped out as to save labour. The materials produced could be utilised in making mortar, and any remaining would be much reduced in bulk, and could be deposited anywhere with safety. The Lord Mayor (Mr. Simon) suggests that the steam produced could be used to provide hot water in the adjoining houses.

At present we are carrying on a wasteful system and taking money from the future City, as some of our public tips, if not all, are unfit for building purposes.

These tips, at present, in hot summers, breed flies, and in windy weather scatter dirt and sepsis, besides being otherwise quite frequently an intolerable nuisance. I regard them as a powerful contribution to the septic diseases which devastate this population. It should be remembered that a large amount of the prevalent pneumonia in children is due to sepsis.

3. While acknowledging thankfully what the Education Department are doing in the way of instruction of teachers and senior girls in

elementary hygiene and in the care of the young, I am of opinion that this department of education should be much more developed.

The first effort made in Manchester, apart from the work of the children's hospitals, to give some guidance in connection with the management of children appears to have been made by the Manchester and Salford Ladies' Health Society, founded so far back as 1862.

No record is preserved of the early work, but, from an account compiled by Mr. Dunks, of the Public Health Office, it consisted chiefly at first of instruction in the shape of leaflets distributed by members of the society. Gradually it was found necessary to employ visitors to call at the homes in the poor districts and directly to instruct and help poor women. In 1890 the Corporation paid the wages of six out of the staff employed by the society, and at the same time Dr. Tatham must have assumed a general supervision of the work which they carried on. In his quarterly returns for 1893 first appears a systematic statement of the work. At this time the society had 14 visitors employed in the poorest districts of Manchester, and the tabular statement of their work is almost entirely concerned with the condition of the houses. There can be no doubt that at that time the help which they rendered was chiefly in connection with keeping the houses clean and in good repair. The same remark applies to the Jewish Ladies' Health Society, who employed two visitors in the districts of Red Bank and Strangeways.

In 1894 leaflets dealing with consumption, diarrhoea, the feeding of infants, and suggestions to householders on general health management were drawn up, and were distributed and explained by the health visitors. Every week, also, the ladies in charge of districts held a meeting of mothers, attended by the health visitors, discussed difficulties, and gave a talk to the mothers on subjects relating to health.

The society, whether from motives of economy or from conviction, had made it a fundamental principle that the health visitors should be chosen from amongst the class whom they were employed to visit, on the ground that they would be better received and have more influence than persons with education. The visitors were, therefore, untrained for their difficult task and unqualified, except in so far as either the health visitor herself or the lady who supervised her work possessed the requisite knowledge and insight. The work was therefore very unequal in character, though a surprising amount of good was done under the circumstances.

Another principle was that the health visitors should live in their district, and be at all times available for poor people wanting advice. The work of health visiting, if conscientiously carried out, is most exhausting, and this additional requirement had ultimately to be abandoned.

An account of their work is given in the Annual Report for 1896. Their duties comprised :—

1. Seeing that houses were kept clean, and supplying the means for limewashing.
2. Instructing mothers in the care of children, and reporting cases of cruelty or neglect to the N.S.P.C.C.
3. Oral instruction in the directions given in leaflets, *inter alia*, in connection with infant feeding.
4. Filling in death cards.
5. Rendering help on behalf of the society in various ways.
6. Recommending suitable children to the Children's Holiday Fund.

In 1897 the Corporation agreed to pay the wages of 9 out of the 16 public health visitors.

In the Annual Report for 1899 the work of the society is given in fuller detail, especially as regards the important subject of limewashing. But the systematic work here set forth is largely concerned with the conditions of housing. From this point onwards full accounts are given of the work in the annual reports down to the present time, so far as it admits of tabulation.

In 1899 an interesting experiment was started in connection with the Jewish Ladies' Health Society. A special visitor was appointed (Miss Blumenthal), paid by the Corporation to work under the Medical Officer of Health, with a view to see whether the dirty conditions prevailing in Red Bank could not be remedied. I put in a good amount of personal work, and Inspector Gray of the Sanitary Department also gave much assistance.

There was no doubt about the success of the experiment. The district chosen was revolutionised in point of cleanliness, and many of the sanitary defects remedied. But it wore out the health visitor, and the amount of time required was excessive. A year or two after visiting was given up, the district had largely relapsed.

In 1899 the districts provided with health visitors were increased by two. In 1902 we received valuable aid from Mrs. Crosbie, who accompanied the health visitors and gave them precise directions in the technique of infant feeding at the homes and in other matters. Her report is given in the annual report of the Medical Officer of Health. She suggests the appointment of a trained lady to supervise, stimulate, and instruct the health visitors. This is the first time that the subject of infant care receives the prominence which is its due.

In 1899 the health visitors began to exercise supervision over families in which a case of pulmonary tuberculosis had been notified under the scheme passed in 1899, along with the district inspectors.

The Annual Reports for 1905 and 1906 record that Miss Eleanor Greg, afterwards Mrs. S. P. Grundy, had undertaken, on behalf of the Ladies' Public Health Society, to supervise the work of the health visitors for the Medical Officer of Health. It would be difficult to overestimate the value of this service.

The health visitors were now drilled systematically in the steps required to render the artificial feeding of infants reasonably safe, and also in the proper clothing and care of infants, with systematic instruction in the materials and make-up of infants' clothes. The reports and records were carefully supervised, and the work took on new life.

In 1907 the visitors of the Ladies' Public Health Society were transferred to the Corporation, an operation by no means easy either from the side of the society or from that of the Sanitary Committee.

The former viewed with jealousy the transference of their work, and the latter were very critical as to the quality of the workers transferred. At the same time the work had become more responsible, and demanded the introduction of a more highly-qualified element, while it was felt that it would be ungracious on the part of the Corporation to start a new organisation which must, in effect, supersede and displace the existing workers, some of whom at all events had shown themselves highly efficient. It was understood, however, that future appointments must be of fully certified nurses.

In the Annual Report for 1908 Miss Greg's report shows the character of the change which had taken place. The duties of the health visitors are defined, and the care and feeding of infants now takes first place. The record of work is recast, and the methods now take on their permanent form.

This report is a model of clearness and conciseness, and shows a marked advance in method. The foundation and objects of the Mothers' Guild (the School for Mothers) are set forth, and co-operation established with the new consultations at Ancoats and Cillyhurst.

A system of voluntary notification of births by midwives, and co-operation between the midwives and health visitors, was arranged at an early period, as it is most important that the health visitor should be in a position to give advice to mothers as soon as possible. Owing, however, to local opposition, the Notification of Births Act, 1907, was not adopted till 1912.

Meanwhile, another very important movement for the protection of mothers was carried forward. In 1902 the Midwives Act became law, which required that all midwives practising as such must be registered, and that a roll of midwives must be kept up to date under the charge of a Board to be called the Central Midwives Board. Midwives without qualifications were to be admitted to the roll under the title of *bona fide*

midwives, and all future midwives were to be admitted only after a defined course of training and after passing the examination of the Central Midwives Board. The Board were required under the Act to frame rules for a variety of purposes, and, *inter alia*, defining the course of action to be pursued by midwives in various contingencies. The local authorities responsible for carrying out the Act were to be County Councils and County Boroughs. In 1904 steps were taken to put the Act in force in Manchester, and, as it was desired to co-opt specially skilled medical men on the Committee for carrying it out, the Town Clerk gave it as his opinion that a special committee must be appointed.

The Special Committee formed appointed Dr. A. W. Chapman as their chairman. Early in 1905 the committee determined to appoint a medical woman to be the Executive Officer, and they were fortunate in securing the services of Dr. Margaret Merry Smith, under whose skilful and vigorous management the midwives were firmly but sympathetically handled, and a rapid improvement was effected. The credit for this was due in large measure to the late Sir William Japp Sinclair, who had much to do with the framing of the rules governing the practice of midwives. At an early stage, the committee tackled a number of questions such as the instruction to be given to midwives, the management of infants during the first ten days of life, the action to be taken in cases of ophthalmia neonatorum, and the thorny question of medical fees to be paid to medical practitioners called in under the rules.

Excellent courses of instruction were given personally by Dr. Merry Smith to midwives, and afterwards by Dr. Cunningham. A full report on the Act will be found in the Annual Report for 1904, and on its administration in 1905 and subsequent years.

There can, I think, be no doubt that the right course was pursued in Manchester in placing the control of midwives under a medical executive officer, or that the administration of the Act was specially effective in this City. But I must refer to the reports mentioned to justify this statement.

The recent course of mortality from puerperal fever appears to raise the question whether the supervision exercised is sufficient to ensure the full benefits which the Act is able to confer.

The rules have undergone considerable modifications from time to time, and the influence of the recommendations made by the Manchester Midwives Supervising Committee may be easily seen in the amended rules, *e.g.*, in the definition of puerperal fever, in the requirement that a midwife shall take and record the pulse and temperature of the patient at each visit, entering her records in a notebook or on charts, which must be carefully preserved.

The Midwives Act is very exacting, and it is no easy matter to get it carried out so as to obtain from it the full results.

The improvement effected in most ways is manifest, but, as already said, it may prove necessary to have a searching investigation into the causes why the incidence of puerperal fever does not continue to decline, either here or elsewhere.

To Dr. Cunningham is due the early recognition of the identity of so-called pemphigus neonatorum with impetigo, and the success consequently attaching to her treatment.

We now come to another movement designed to affect the welfare of mothers and thereby that of their children. The Guild for Mothers consisted of a large and intellectually strong association of ladies in Manchester, who formed themselves into a guild in 1908, having for their general object to get in touch with the mothers in different parts of the City, and to give them assistance in various ways by lessons in hygiene, in sewing, in making up, in cookery, and so forth. But, in addition, they had the definite purpose of giving skilled assistance to mothers in the care of their infants by the establishment of consultation centres in different parts of Manchester, at which they should receive skilled medical advice, aided by a trained nurse in charge of the centre. In pursuance of their purpose to help poorer mothers, they sold milk and dried milk at reduced prices. But their chief achievement was the establishment of consultation centres at which poor mothers could get free skilled advice in the management of their infants.

The first consultation centre was at Mill Street, Ancoats, in 1908, followed by Lower Openshaw, in 1910; Rosamond Street, Chorlton-on-Medlock, in 1910; Collyhurst, also in 1910; West Gorton, in 1914, and Cheetham, in 1915. They were fortunate in their first medical adviser, Dr. Weitzmann, and in her immediate successor, Dr. G. H. Hickling.

The Guild was keenly backed by the lady doctors in Manchester, without whose assistance it could not have had the great success which attended it. It had the good fortune to have Mr. T. R. Marr as chairman, an experienced and skilful enthusiast in social work, and also of Dr. C. P. Lapage, Dr. Hugh Ashby, and others.

To resume the subject of health visitors. On the retirement of Miss Greg, in 1909, we were able to secure the services of Miss Howard, who acted as Superintendent of Health Visitors up to 1915, when she died. She had great sympathy with the poor and with her visitors, with good judgment in appreciating the qualifications of candidates for the post of health visitor. During her term of office the personelle of the staff gradually changed, assuming a more professional and skilled character. The character and extent of the work during this period can be followed in any of her annual reports. Her successor, Miss M. G. Seed, has proved herself in every way an admirable head, as organiser and administrator.

In 1908 an enquiry was begun in the district of Ancoats for the Home Office into the influence of industrial work, of poverty, of breast-feeding, and other causes on the health of infants. With the assistance of Miss Greg and Miss Howard this was completed in 1909, and a statement was given on the subject in the Annual Report for that year. This brought out the injurious effect of industrial work on the health of infants.

In 1910 ophthalmia neonatorum, which had been the subject of much study by Dr. John Wharton of this City, was made notifiable, and in 1911, at the instance of the South Manchester Division of the British Medical Association, an eye nurse was appointed to visit and advise mothers on the treatment of their children suffering from this affection, which had given rise to many cases of blindness.

Her work was organised by Dr. B. M. Cunningham, and a full statement of the methods adopted is given in the Annual Report for 1910.

A separate section on this condition is given in this and in subsequent annual reports. The work was gradually extended, and three ophthalmic nurses are now engaged on it. The bacteriology of all eyes supposed to be affected is now investigated. Much care has been expended by Dr. Drummond in classifying, after investigation, cases notified by medical practitioners, reported by midwives, or otherwise ascertained. She keeps in separate divisions cases notified by practitioners, cases ascertained to be cases of true ophthalmia neonatorum, and cases reported by midwives, or otherwise ascertained. But, legally, cases notified by a practitioner are to be regarded as cases of ophthalmia neonatorum. The improvement effected in the results of notified cases has been very great, but the essential matter is to prevent their occurrence. This can be effected at birth by proper treatment of the eyes of the newly born.

In their instructions on the rules of the Central Midwives Board, in 1905, the Midwives Supervising Committee advised the use of boracic solution, being afraid to trust the *bona fide* midwife with nitrate of silver solution.

The character of the midwives has now changed, and the use of silver nitrate solution is now enjoined. The results will be followed with much interest.

At this point it may be of interest to recall that a long report on infant mortality was presented by me to the Sanitary Committee in 1907, much of which, however, dealt with other matters than those here touched upon. It does not appear in the annual reports.

It has already been mentioned that Sir Arthur Newsholme issued from the Local Government Board a succession of reports on infant mortality. In 1914, the Local Government Board issued a memorandum drawing into one scheme the various agencies dealing with maternity and child welfare, and offering Government financial assistance in defraying the

cost for certain defined services. The Medical Officer of Health was therefore instructed to prepare a statement embracing the different agencies at work concerned with maternity and child welfare.

A report was prepared and presented to the Finance Committee and to the Council. It was, however, referred back, and a fresh report was prepared which provided (1) for a considerable increase in the number of health visitors, (2) for taking over the six existing centres of the School for Mothers so far as medical services are concerned, and for providing four additional centres on condition that the School for Mothers would provide the social work needed, as well for the new as for the old centres, (3) for the appointment of a whole-time officer to take charge of the clinics, aided by four consultations a week to be held by two consulting physicians, and (4) to provide for increase in the number of clerks.

This final report was accepted by the Local Government Board.

The framework of the scheme as it now stands may be said to have been established in this report. As a matter of fact, the number of health visitors, which was 18 at the end of 1914, increased at the end of 1915 to 27, and at the end of 1916 to 36. It has since then been increased to 52, so as to cover a great part of the City. But these visitors have to discharge many duties, such as visiting cases of measles, whooping cough, diarrhoea, pneumonia, and influenza.

In 1915, the Notification of Births Act was made compulsory, the object being to give timely intimation of births, so that, when the midwife ceases to visit, the health visitor may at once take her place. Notification has to be made within 36 hours. Notification has not yet become so complete as registration of births, but the one is a check upon the other. Considerable discussion has taken place as to whether registration should not be abandoned. Were this done, there would be no means of ascertaining whether notification had been carried out or not. I am of opinion that both notification and registration should be retained.

In 1917 Dr. Drummond was formally appointed by the Sanitary Committee as Assistant Medical Officer to take charge, under the Medical Officer of Health, of the Maternity and Child Welfare Department.

In 1916 the School for Mothers commenced to sell milk under cost to poor mothers on the prescription of their medical officers, but the expense became so great that they asked the Corporation to take over the work, which was generally admitted to be necessary. The Sanitary Committee agreed, but fixed the expenditure at £70 a month, although they were warned by the School for Mothers that this sum was too little. Unfortunately, I had omitted to ascertain the rate at which the expenditure had been increasing, and the expenses, as well past as present,

much exceeded the sum allowed. In order to make the charges square with the allowance, the only course open was to raise the price of milk, which was accordingly done.

The Committee requested a statement on the amount which was required, and a report was prepared by the Medical Officer of Health showing an annual estimate of £9,650. This was raised by the Committee to £10,500, so as to allow of expenditure for administrative expenses, and was passed by the Council and by the Local Government Board.

Meanwhile the Ministry of Food had issued the Milk (Mothers and Children) Order, 1918, under the Defence of the Realm Regulations, by which it became practically imperative to give assistance in the form of milk, under conditions laid down by the Local Government Board.

The Infant Life Preservation Sub-Committee, however, were not satisfied as to the control to be exercised, and requested a further report from the Medical Officer of Health on the details of administration. A previous statement, with copies of the Order and of the requirements of the Local Government Board, along with the detailed report just mentioned, are given in the Annual Report for 1918, pages 71 to 88. These reports and Orders, etc., practically govern the present procedure, with one important exception. A statement having been made by a member of the Committee that milk was being given in cases where a grant was not justified by the family income, and this statement having been verified by the direct investigations of the Medical Officer of Health and his inspectors, it became necessary to change the mode of investigation of the family incomes. Special investigators were therefore appointed by the Committee, an arrangement which appears to be satisfactory. It must be admitted, however, that it is no easy matter to be sure that public money is properly expended, and that great vigilance is required, even when all seems to be working well, and even when adequate precautions seem to have been taken.

Various modifications in the amounts allowed and in other matters have been imposed by the Ministry of Health, but the methods pursued are those given in the Annual Report for 1918, with the exception indicated, which is only one of administrative detail.

It is a pity that the work of the centres should be inwoven with a scheme for the sale of milk under cost, as it makes it difficult to determine when an advance in the popularity of the centres is due to appreciation or to material aid. Such aid should, as far as possible, be confined to periods of distress. In my opinion, the Maternity and Child Welfare Centres are now strong enough to keep their hold when this form of assistance is withdrawn, or rather when it is reduced to a minimum and kept strictly controlled.

It may be pointed out that the expenditure on milk has never reached the estimate made in 1919, and the largest amount expended in any one year is £4,655 6s. 2d. in the year ended 31st March, 1923.

The Maternity and Child Welfare Act, 1918, co-ordinated the various municipal services dealing with maternity and child welfare, and conferred further powers on sanitary authorities to make provision for a number of requirements arising in connection with this branch of work. These are exhaustively set forth in the memo of the Local Government Board (Maternity and Child Welfare 4), August 9th, 1918. These services were placed under a Sub-committee of the Sanitary Committee, to which Miss Ashton, as Chairman, rendered most valuable service. On the basis of the Act and of this memorandum, an extension of the Maternity and Child Welfare Scheme was put forward in a report dated March 17th, 1918.

In considering the need for this extension, it is necessary to bear in mind that a large amount of provision had been made in voluntary institutions; 55 beds are provided by St. Mary's Hospital for complicated cases of labour in their Whitworth Street Hospital.

The Manchester Children's Hospital at Pendlebury has 188 beds, and a considerable provision for the diseases of children is also made by the Ancoats, Northern, and St. Mary's Hospitals. The Manchester Babies' Hospital has 40 cots. The Royal Eye Hospital makes provision for the treatment of cases of ophthalmia neonatorum.

Uncomplicated cases of maternity are badly provided for, and the provision for wasting diseases of children is quite inadequate. These facts react unfavourably on the usefulness of Maternity and Child Welfare Centres, requiring, as they do, to be able to make provision for such necessitous and urgent cases as they may encounter. A proposal for the provision of Cottage Maternity Homes had been before the Midwives' Supervising Committee and deferred.

A statement on the provision made by voluntary hospitals in Manchester is given in my Annual Report for 1919, page 220.

This extension embraces:—

1. The provision of midwives in districts in which their services were required: Two such districts were known to Dr. M. Douglas Drummond, and midwives were appointed at a guaranteed income. The experiment was a failure, and both midwives gave up their districts.

2. Six additional health visitors were recommended and appointed.

3. Two additional maternity nurses—making four in all—were appointed to assist midwives in dealing with puerperal fever, abortions, and other incidents of childbirth. To this was subsequently added an Assistant Inspector of Midwives, acting directly under the instructions of Dr. Drummond.

4. Two additional full-time medical officers to hold consultations at the maternity and child welfare centres—making four in all. An important part of their duties was the consideration of the reports of health visitors, and advising the health visitors in regard to them. In other ways also the work of the health visitors was co-ordinated with the centres. It is their business to recommend and urge mothers, in suitable cases, to attend the consultation centres, and time is given to them to attend the consultations and see the work of the medical officers.

5. Provision was made for the equipment of 10 ante-natal clinics. All the medical officers are qualified to carry these on, and they are authorised to make examinations when necessary, so as to enable them to make recommendations as regards treatment.

6. An estimate was made for the equipment of two maternity hostels, to be provided and worked by the Corporation as far as midwifery service was concerned, the lying-in women to be medically attended by their own doctors. This proposal was, however, put aside by the Midwives Supervising Committee in favour of a larger future scheme to be brought forward by the medical profession.

7. The proposal to provide home helps was not proceeded with, as the Local Government Board proposed themselves to initiate a scheme. It may be stated that we had great difficulty in procuring home helps in connection with the influenza outbreaks, and that any scheme will require to be worked out from small beginnings, and with due regard to all the conditions and prejudices involved.

8. A proposal was put forward to secure 40 beds in the Manchester Children's Hospital. The hospital was, for the first time, ready to agree, as the Board were then short of funds. The Local Government Board took exception to the proposal to include the treatment of early cases of spinal caries as trenching on the tuberculosis scheme. Even had it been allowed, it need only have been temporary, as there are, at all times, numerous young children suffering from obscure wasting maladies, and it would have been easy to replace tuberculous cases when provision was made in a hospital for tuberculous children. Still, this was no necessary part of the proposal, the rejection of which must be viewed with regret.

9. It was proposed to secure five beds at St. Mary's Hospital in connection with the ante-natal centres proposed to be established. Experience has shown that any scheme of instruction on administration in connection with disease is greatly aided by possessing even a few beds to which they can send patients in their own right. This proposal, also, was rejected by the Board.

10. It was proposed to reserve 20 (reduced to 10) cots in day nurseries to be reserved for poor mothers obliged to go to work and yet unable to pay the charges. This proposal would have given the Department

a direct and increased interest in the condition of day nurseries. The proposal was passed, but has not become active, possibly because the charge proposed (10s. per week) was rather low. It is quite certain that a day nursery, fully equipped, cannot be run for this sum. It was contemplated, however, that if the conditions were satisfactory the charge should be raised. I did not consider that the Corporation should provide day nurseries.

11. Provision was made for payment of 10 beds and 10 cots for poor mothers and infants, the estimated cost at an institution being £2 per week, of which the Corporation were to pay half. The Sanitary Committee did not see their way to undertake homes for this purpose, but were willing to consider payment in suitable institutions. The proposal was, however, withdrawn. It is only represented by two items in the ultimate proposals, viz., (a) assistance to five mothers to enable them to stay at home, a sum of 15s. a week being allowed, (b) payment of two foster-mothers at 15s. per week.

12. Provision for sending children to convalescent homes—20 beds at 15s. per week. This experiment was tried, but was not considered to yield satisfactory results.

13. Provision of two skilled investigators to enquire into family incomes in connection with the milk supplied at less than cost price. The number was afterwards increased to three. Possibly the cost of these investigators was equal to the loss which would have been incurred without their assistance. But the principle is right, and even necessary, at all events in connection with this particular expenditure.

When the results of this extension are considered, it will be agreed that the first scheme really fixed the basis of the work. For the time, at all events, and having regard to the voluntary agencies at work, it appeared best to consolidate the advances already made, rather than to launch on new ones, guided rather by their urgent needs than by special though limited requirements.

With regard to the health visitors, the most urgent need was the supply of a sufficient number of trained visitors best fitted to carry out the work of skilled instruction and judicious stimulation.

In this aim the Local Government Board and the Ministry were in accord with the Corporation, and, in fact, urged them to make an increased number of appointments. From the time when we took over the health visitors of the Ladies' Public Health Society, we made it the primary condition of appointment that health visitors shall possess a certificate of three years' training in a recognised hospital, our view being that nothing can replace trained familiarity with the ailments of childhood and with the procedures found useful in hospital to meet their needs.

During the war we were under pressure to increase our staff. It was a bad period for rapid increase. The more enterprising nurses were engaged in military work, and our choice of candidates was much restricted. The change in quality was very manifest, though every effort was made to choose the best. Our nurses were now, for the most part, union trained, and though such training may be very good, there is apt to be a lack of enterprise and individuality in the product. I am still of opinion that the condition of a certificate of training should be required, but I should give preference to training in a hospital for children.

The Ministry have given much attention to the qualifications which they demand for health visitors, and in July, 1919, the Board of Education issued draft regulations for the training of health visitors. The tendency at present is to demand too much rather than too little, but there can be no doubt for the need of practical training.

At present the tendency is to require from health visitors, in addition to their nursing experience and qualifications, proof of having passed the examination of the Central Midwives Board, or that of the Sanitary Institute or some other body. These may be a protection to the health visitor if she fails or finds the work distasteful, and in some instances they may be useful. But I doubt if appointments should be made simply because of the possession of either of them.

The quality of the health visitor, after a year or two, depends more on these factors:—

1. Careful choice of successful candidates.
2. Good system of training in their duties.
3. Practical recognition by adequate remuneration of the work of good health visitors. If this does not obtain, the quality of candidates will decline.

I do not consider that the number of health visitors is sufficient. The practical test is that they are not able to carry out continuously their work as health visitors and meet the other calls on their time when measles, whooping cough, diarrhoea or other diseases which they are expected to deal with are epidemic. They are now required to keep up continued supervision over the health of children during the first five years of life. This work should be most strenuous in the first, second, and fifth years—the fifth so that the condition of the children shall be freshest in their minds when their final reports are handed over to the Education Department. In Manchester, at all events, the average number of visits is insufficient.

The Ministry of Health consider that 400 births is enough per health visitor. I should say, with all the obligations resting upon them, it is considerably too much for one visitor in Manchester, but I should not like to specify the number required. It is best to meet deficits by

cautious and gradual additions until there are found to be enough. The superintendent of health visitors should be the best judge of the need. She has to examine the health visitor's work, and find out how much she can normally do. The Medical Officer of Health, or whoever examines their reports, should also give a judgment on this question.

In the establishment of centres, the first requisite is to find suitable premises, and the next to plan out such alterations as will adapt them for the different tasks which they have to fulfil. Rooms must be found or made for waiting rooms, a babies' weighing room, a consulting room, a sale room, perhaps a dispensary, a committee room, a superintendent's room, a kitchen. Outside, will be required a shelter for prams. One of the rooms must be suitable and available for the classes given by the ladies of the School for Mothers.

Great assistance, both in securing premises and in planning out alterations, has been received from Mr. John Irvine. But it has not been easy to find suitable premises, and the additions to the centres have been only gradual because of this difficulty, and because of the necessity to have them thoroughly equipped.

A very important addition to these centres has been the securing of a massage room, in which massage is given by trained and skilled masseuses to children suffering from the results of poliomyelitis, rickets, constipation, or other abdominal trouble. There is no doubt as to the great value of this service, which is recognised by the Ministry of Health.

There are now nine ante-natal centres for consultation. Two of these are adapted for the treatment of venereal disease.

There are, now, 12 centres under the Corporation, in which the number of consultations continues to increase. In the case of three of the first centres taken over, suitable premises have since been found, and only two now await the securing and equipment of suitable premises.

Four of the centres are provided with dispensaries, and, though these have a certain value, it is not intended to add any fresh treatment centres.

There is a dental clinic at 72, Rosamond Street West, which is worked in conjunction with the Dental Hospital.

The superintendents of the centres have multiform duties. They keep all records required by the Corporation, prepare the children for medical consultations, supervise the weighing of babies, filter out cases for the doctors, take instructions in reference to them, and on the arrival of a new case visit the home. After this first visit, however, they hand the visiting over to the health visitors.

Nursing is carried out in general by health visitors only when an urgent need presses. Nursing visits, but not continuous nursing,

unless in exceptional instances, is provided by the Manchester and Salford District Nursing Association.

On the other hand, recourse has been had to the Association in connection with a severe outbreak of measles.

At the instance of the Ministry of Health an effort was made to arrange for nursing visits by the Association. But I considered it a necessary condition of any joint action that the nurses acting for the Corporation should, during the time for which they were required, attend at the Public Health Office at office hours and write up their reports for supervision by the Medical Officer of Health. As the Association did not agree to this, no arrangement was made.

Supposing this difficulty overcome, it should be understood that the systematic visiting carried out by the health visitors must be kept up during an outbreak. Providing the nurses carried out the official work as usual, their special visits could be arranged for.

At present the Association nurses work under the medical practitioners of the City, and do excellent work in that relation.

The Corporation have agreed to give them for a year a grant of £500, to be revised at the end of the year under certain conditions. It is understood that they will assist, if possible, in any epidemic emergency. Their time is fully occupied by the Association.

In 1909 the Sanitary Committee provided a station for personal cleansing at 299, Oldham Road, fitted with three baths, an undressing room and a waiting room. This is for the most part used for the cleansing of school children.

A cleansing nurse was appointed in connection with the health visitors, whose duty it was to visit homes where children were reported by the Education Department as persistently verminous. My object was to see that all verminous persons who could be ascertained to be so should be visited, as I do not consider that the action taken by the school authorities is sufficient unless measures of cleansing are taken for the whole family. My views on the important question of verminous persons are given in the Annual Report of the Medical Officer of Health for 1919, page 164. The subject should, I think, not be allowed to rest. The experience of Monsall Hospital shows that vermin in the head is past praying for. But I understand that Dr. Ritchie has now a staff engaged specially for this purpose. In my opinion, cleansing of the person should be made compulsory. No verminous person should be allowed to engage in an occupation in association with others, nor allowed to remain at work so long as the verminous condition continues. There appears to be no sufficient reason why the presence of vermin on the person should not be made a notifiable disease, and steps taken to delouse the case.

In the Annual Report of the Medical Officer of Health for the year 1916, page 38 *et seq.*, will be found a review of the action taken up to that date with a view to reduce infantile mortality, although it is, in reality, rather an account of the steps taken officially and directly in connection with maternity and child welfare.

Specific sections will be found in consecutive annual reports setting forth the work for the year so far as concerns the administration under the Midwives Act, the work of the health visitors, the work of the Maternity and Child Welfare Centres, ophthalmia neonatorum, and the independent work of the School for Mothers. The latter, it may be stated, since the medical work of their centres was handed over to the Corporation, have invaded new districts, and now run five quite independent Maternity and Child Welfare Centres in Rusholme, Levenshulme, Didsbury, Withington, and Chorlton-cum-Hardy.

In all administrative work concerned with skilled advice as to the management or prevention of diseased conditions, it is found to be of great assistance to possess the means of obtaining skilled treatment for poor children, for whom advice is not sufficient in itself. The voluntary hospitals receiving children have always assisted the Maternity and Child Welfare Centres and the Health Visitors Department by taking in cases referred to them. Full use has been made of the aid thus afforded, and special acknowledgment should be made of the assistance given by the Manchester Children's Hospital by the Guardians at their Booth Hall Infirmary, under Dr. D'Ewart, by the Babies' Hospital and others.

But, of course, beds are not always available, and it is desirable that more accommodation should be obtained in connection with the department, so that treatment can be secured when urgently needed. Fortunately, 18 beds have been engaged at the Babies' Hospital in Levenshulme. This is an institution under the care of the lady doctors in Manchester, who have made it their special business to study the ailments of young children, and particularly those obscure conditions of malnutrition which also give trouble to the Public Health Preventive Department.

A ward for 10 cases of diarrhoea or malnutrition is also set apart at Monsall Hospital. The general and special provisions thus made are insufficient. Nevertheless, they have given great assistance to this department of public health work.

Another branch of the service deserves mention. The School for Mothers has established day nurseries at Openshaw, Collyhurst, and an open-air day nursery at Ancoats, to which special cases are referred by the centres for observation. This also is a valuable assistance, and such day nurseries deserve encouragement, although I do not consider that the Corporation should establish day nurseries of the ordinary type.

INVESTIGATION INTO THE VALUE OF THE WORK OF HEALTH VISITORS.

It is difficult to gauge the value of health visitors in the reduction of infantile mortality, and in 1911 a valuable experiment was initiated in Openshaw to determine, if possible, what they were capable of effecting. Miss Simon generously defrayed the expenditure to the extent of £200 per annum, and in fact suggested the experiment. The lines of the investigation were laid down by Dr. C. P. Lapage and myself. Two visitors were to undertake the visiting of two special districts in Openshaw, the records of the health of children being recorded on forms which we drew up. Dr. Weitzmann undertook the work of supervision. It was a great pleasure to work with Mrs. Weitzmann, whose sympathetic interest, knowledge of the work, and critical intellect ensured that the best use would be made of the opportunity afforded for determining the value of intensive visiting. I, personally, visited a large number of the houses, and made myself acquainted with the districts generally. The investigation sheets were examined and annotated by at least two observers—myself and Dr. Weitzmann—and, I believe, also, by Dr. Lapage, during the greater part of the four years over which the experiment lasted.

The areas in question extended into Openshaw, Ardwick, and Bradford. They were chosen so as to represent the mean of the characters exhibited by the districts, and so as to give about the same average number of births. The number of births was such as to allow of systematic monthly visiting. The chief special drawback of the districts was the presence of chemical fumes, which left manifest traces on metalwork and curtains, and the great amount of smoke emitted. My special inspectors drew up a general description of the districts, which gives a somewhat unfavourable character to the inhabitants. The houses they found fairly well built and clean. The women they describe as careless and gossiping, not given to expend much trouble in cooking, and relying largely on fried-fish shops. The general death rate of the whole of the sanitary districts, in which the areas visited lay, was high. Stables were not specially numerous. They had reason to think that abortion was extensively induced.

I am disposed to regard their description as giving rather too favourable a description than otherwise.

I was much struck by the great irregularity between the records made and the vital energy displayed by different visitors, of whom there were altogether four, during the five years (May, 1911, to May, 1916) that the experiment lasted. Since each child had to be followed for 12 months, the total number of children born belonged to the four years, May, 1911, to May, 1915. This question of the essential and great difference in observation and other qualities is one which obtruded itself very strongly, and I do not doubt that similar differences exist in the present staff.

The investigation brought home to us the vital need for constant supervision and unceasing training of the whole staff of health visitors. The initial differences will, of course, remain, but the general level will thus be raised.

I was much struck then and since by the failure of many health visitors to appreciate the immense importance of the regular and accurate weighing of infants, and of the tremendous advantage that the health visitor thus gains in determining when medical assistance is required by infants. It is not too much to say that a good portable weighing machine is the clinical thermometer of the health visitor.

Another point which struck me very much was the manner in which mortality from lung disease and diarrhoea alternated in the same family, and was associated often with septic sores. One would be inclined to lay the chief stress on sepsis as the cause, in one shape or another, of infant mortality. In fact, I then got the impression that fatal diarrhoea in infants may be largely the result of sepsis, and I think this possibility needs further investigation.

The special inspectors drew attention to the great extent to which careless mothers expose young children to cold, and, in the earlier years when I did much visiting, I have often seen the children with nothing but a cotton rag on at midday in cold weather, the mother out at work, lying in bed, or out gossiping. It was quite common to take young babies to Belle Vue in bitter weather. Matters are much improved since that time, but I doubt whether these fatal neglects have ceased to occur.

The statistics prepared for this experiment, to show the change in mortality resulting from it, do not convey a very hopeful impression of the results of health visiting. When it was started I was of opinion that a few years would show a marked difference. Dr. Weitzmann states that five years (really, four) is not enough to show a marked change. That is a very hopeful view to take of the results of health visiting, and must, of course, be correct. The habits of generations are not to be altered in a day, and perhaps one does not sufficiently appreciate how much young industrial mothers are dependent on their mothers and grandmothers, even if they wish themselves to follow the advice given to them. Then, again, the effects of health visiting when carried out from house to house, and without special reference to infectious disease, will have little effect on that class of disease, at least for a long time. Visiting for that purpose must be intensive and direct, and it is in these outbreaks a great matter to be able to supply fuel and milk as and when necessary.

This experiment began in May, 1911, in which year it cannot be supposed to have materially affected the death rate. If, now, we

compare the infantile mortalities for 1906-10 with those for 1911-15, we get :—

INFANTILE MORTALITIES.

Years.	District No. 1.	District No. 2.	Total Sanitary Districts of Bradford, Ard- wick, and Openshaw.	The whole City.
1906-10.....	176.5	146.6	154.8	147
1911-15.....	135.7	155.9	143.4	133

District No. 1, therefore, appeared to advance faster than the adjoining districts or the whole City, while district No. 2 went back.

It is difficult, however, to eliminate the effects of epidemics in small districts.

If we eliminate the years 1911 and 1915—1911 which could not have been much affected, and was a very heavy diarrhoea year, and 1915, in which visiting continued only for three months—we get :—

INFANTILE MORTALITY.

Years.	District No. 1.	District No. 2.	The entire Districts.	The City.
1912-14.....	136	136	136	127

When we compare these figures with those for 1906-10, the conclusions remain the same as above. If we break up the mortalities into groups of diseases (*a*) infections which we should expect to be little affected by visiting; (*b*) a group consisting of diarrhoea, nervous disease, bronchitis, pneumonia, and diseases of the digestive system, which ought to be markedly affected, and a group prematurity, atrophy, and congenital disease, which would be slow to be influenced, and if we then compare the mortalities so divided for the years 1906-11 with those for the years 1912-13, we find that, as a matter of fact, there is marked relative improvement under the second group for both districts.

I am of opinion, then, that a marked improvement was effected in district 1, and a lesser improvement in district 2. The details, however, support Dr. Weitzmann's contention that the period is too short to arrive at a conclusion as regards the amount of good done.

Dr. Weitzmann's elaborate and laborious but clear analysis of the observations made led her, though with some misgivings as to the entire reliability of the facts, to the following conclusions, which refer to 2,416 children born alive in the two districts :—

" It is interesting to note that *parents' health* equally affects the state of health and death rate of the children. This is a powerful influence.

" The income of the family affects the death rate more than the state of health, but we must remember that this income is probably an index of the capacity of the father, and therefore in this case the *health of the parents* as well as the income will come into play.

" *Unsatisfactory House Conditions.*—This affects slightly the death rates, but gives a greater percentage of unhealthy children : in fact, it occupies the first position amongst the factors producing ill-health in children.

" *With regard to the feeding*, once more we see that the death rate of artificially-fed children is more than two and a half times higher than that of the breast-fed. Next comes mixed feeding, then those partially fed on the breast, and the artificially-fed sustain the highest mortality."

This excellent piece of work deals only with the conditions ascertained in the children, and not at all with the statistical results of the four years' visiting. It must be admitted that this experiment showed the results of home visiting to be much slower than one had expected, while giving some hope that it may not always be so.

In conclusion, we may enquire what are the causes which have led to the reduction of infantile mortality by one half since 1891. No one cause has been at work. The searchlight which has been turned on since 1904 alone counts for much. The Children Act of 1908 made it plain that obvious infantile neglect would not be tolerated. A great process of education of mothers has been in progress for many years. The City has been made comparatively clean by the labours of the Sanitary Committee. The strenuous attempts of the Sanitary Committee, only partially successful, to remove causes of epidemic summer diarrhoea, have counted for a good deal. But, unquestionably, much has been due to the house-to-house visits of health visitors, and the associated education of mothers at the Maternity and Child Welfare Centres. Much more remains to be done, and further progress may be confidently anticipated, were it only from the increased attention being given to children by the medical profession in general, by the School Medical Service, and by the Tuberculosis Service in particular.

THE PRESENT COMPOSITION, WITH REMARKS ON THE EVOLUTION OF THE PUBLIC HEALTH DEPARTMENT.

In the following statement it will be understood that the Medical Officer of Health is responsible to the Public Health Committee directly

for his advice and actions in all matters which come under that committee, and by the resolution of the Public Health Committee, passed in 1919, other officials of the committee are responsible to him as Chief Executive and Consulting Officer of the Committee. To this there is one exception. The Senior Clinical Tuberculosis Officer is independent in so far as clinical matters, as distinguished from administrative matters, are concerned.

The Medical Officer of Health is also liable to be called upon to advise any committee of the Corporation on questions relating to health. But the following summary is concerned only with the work of the Public Health Committee.

When I was appointed Medical Officer of Health in March, 1894, I was ostensibly a consulting officer at the service of any committee of the Town Hall who might desire to ask my opinion on any subject. There was a small staff attached to the Medical Officer of Health, consisting of a chief clerk, a statistical clerk, and several juniors. With their assistance the administrative work and registration of notifiable disease were conducted, the details relating to the reporting and removal of cases, to isolation precautions and so forth, being then, as now, conducted by the district inspectors. Thus from the beginning it was impossible for the Medical Officer of Health to be other than administrative. But the sanitary inspectors were under an independent head, and, though a *modus vivendi* was arrived at, the Medical Officer of Health had no power to co-ordinate work so as to attain the results at which he aimed.

In 1894 the Corporation possessed no hospital except that at Clayton Vale, which had been used by Dr. Tatham for the reception of convalescent cases of smallpox. Even that required extension before it could be used for the treatment of acute cases in 1894. In 1896 Monsall Hospital was taken over from the Board of the Royal Infirmary, and in 1904 Baguley Sanatorium was acquired from Withington on the inclusion of that district in the City. Abergyle Sanatorium was acquired from the Guardians ten years later.

The creation of a staff of qualified health visitors, founded on the old staff of the Ladies' Public Health Society, began in 1908, although the services of the health visitors of that society were regulated and supervised as far back as 1893. The six Child Welfare Centres of the School for Mothers were taken over in 1915. The Midwives Supervising Committee was created in 1904 to carry out the rules and control the practice of midwives, as designed by the Midwives Act, 1902.

The present Maternity and Child Welfare Sub-Committee embraces and extends these various branches of work. They were united and placed under the Maternity and Child Welfare Sub-Committee of the

Sanitary Committee as the result of the Maternity and Child Welfare Act, 1918.

The notification of tuberculosis was undertaken in 1899, but only as a voluntary procedure and only in relation to phthisis. The compulsory notification of tuberculosis in all its forms became obligatory by order of the Local Government Board in 1912.

The National Insurance Act, 1911, added another complex and far-reaching branch of administration, with its three branches of treatment—dispensary, institutional, and domiciliary. So closely are these branches of work interwoven that I felt it needful to place both under the charge of Dr. D. P. Sutherland in 1917.

In 1917, also, a scheme had to be initiated for the treatment of venereal disease.

Additional diseases continued to be added to the list of notifiable infectious diseases, which were, in the main, under the charge of Dr. McClure. Dr. W. A. Young was placed in charge of venereal diseases, of the Rats and Mice Destruction Act, and also of some of the diseases newly made notifiable.

In 1917 Dr. Douglas Drummond was formally appointed to be the head of the maternity and child welfare work under the Medical Officer of Health. These various departments are all new.

The position of housing manager, of which Mr. Irvine is head, is also new, and it is desirable that his responsibility to the Medical Officer of Health should be exactly defined, as it is in his answers to the recent *questionnaire*. Colonel J. W. Brittlebank's department was created in 1899, but has been extended so as to embrace the charge of dairies, cowsheds, and milkshops, and of ice cream manufactories. The staff in this department is at present inadequate.

The Sanitary Department alone had dimensions in 1894 comparable with those which it possesses at present. All the rest has been initiated or has been imposed by Government.

In 1919 the Sanitary Committee appointed the Medical Officer of Health head of the Sanitary Department, and, it will therefore be understood, of the different sections of work which I am now about to enumerate.

In 1917 it became necessary to subdivide the different sections of work, but the sanitary department has not been so subdivided, and remains one distinct section under Mr. H. Dale.

As at present constituted, the Public Health Department is governed by the Public Health Committee, subdivided for convenience of

administration into sub-committees responsible to the whole Public Health Committee, which reviews the proceedings of the sub-committees twice a month and confirms or rejects them, the proceedings of this committee being subject to confirmation by the City Council.

There are, however, integral parts of public health administration which are not under this committee. For example, there is the work of the School Medical Department, whose dissociation from the general work of the public health administration is a weakness and an anomaly. The inspection of unsound foods should be part of the main public health administration, as determined by the Public Health Act, 1875.

The measures taken for the general cleansing of the City should be under the Medical Officer of Health as they originally were.

With these exceptions public health administration is under the Public Health Committee, and therefore by their recent decision, confirmed by the Council, under the Medical Officer of Health as their executive officer.

It comprises the following main subdivisions :—

- (a) Infectious diseases, including Monsall Hospital.
- (b) Tuberculosis, including sanatoria.
- (c) Maternity and child welfare.
- (d) Venereal diseases, etc.
- (e) Work of the Sanitary Department.
- (f) Work of the veterinary surgeon.
- (g) Work of the public analyst and that connected with other laboratories.
- (h) Miscellaneous.

Infectious diseases, so far as clinical work is concerned, are transacted in the Public Health Office, which is immediately under the Medical Officer of Health. Statistics are prepared in this office. This office has a chief clerk, Mr. T. L. Ellwood, a statistical clerk, Mr. Ernest Dunks, and 12 subordinate clerks, of whom 3 are in immediate touch with the Medical Officer of Health, whose office is at some distance from the general office—a most inconvenient arrangement. Mr. Ellwood exercises a general supervision over the Public Health Office, and acts generally as accounts clerk. Mr. Dunks has general supervision over the infectious disease staff. Arrangements are made under his directions for the removal of cases to hospital, and for all procedures in connection with the disinfection of articles and houses, which, in turn, are carried out by the Cleansing Department of the Corporation. Inspectors are here interviewed; records and registers preserved. Statistics are compiled. Mr. Dunks also acts as chief clerk to the maternity and child welfare

section of the work. He has general supervision of those documents which have been preserved in the store room.

Mr. Thomas Chalmers does much of the work of confidential clerk to the Medical Officer of Health.

The senior assistant to the Medical Officer of Health, Dr. W. St. C. McClure, acts as deputy in the absence of the Medical Officer of Health, and takes charge of most of the infectious diseases. He also engages in investigations of food poisoning and other suspicious causes of death, and takes a special interest in food-preparing establishments.

The junior assistant, Dr. W. A. Young, exercises supervision over some infectious diseases, supervises the venereal diseases scheme, and administers the Rats and Mice Destruction Act, besides engaging in such other investigations and administrative work as opportunity may offer or require.

Attached to the Medical Officer of Health are three special sanitary inspectors—Mr. Higginbotham, Mr. Price, and Mr. Lord—who have shown special ability, and have given much assistance in a variety of investigations. These make up in all 20 persons.

Monsall Hospital is the only fever hospital possessed by the Corporation. It is estimated to provide 600 beds. It has been greatly enlarged and improved since it was taken over from the Royal Infirmary in 1896, but many of the buildings are old, and, because of the danger of sepsis, special attention is required to the condition of the floors and walls and to the quality of the nursing. It possesses a medical superintendent and three medical assistant officers, a steward, an assistant steward, a dispenser, a matron, and two assistant matrons. The list of officers is given at page 200 of the Annual Report for 1919. The total number of the staff in that year was 215.

The hospital possesses a laboratory, and the dispenser prepares the media. There is a Washington Lyon's disinfecting machine. The hospital provides treatment for cases of scarlet fever, diphtheria, enteric fever, typhus, erysipelas, puerperal fever, cerebro-spinal fever, encephalitis lethargica, and occasionally, both from misdiagnosis and from other causes, for cases of measles, pneumonia, tuberculosis, and various diseases.

There is a ward for 10 infants, now allocated to the treatment of malnutrition in connection with the work of the Maternity and Child Welfare Department. The annual statements by the medical superintendent, given in the annual reports of the Medical Officer of Health, will show the work in full detail, so far as the diseases treated are concerned.

The medical superintendent should be supreme within the hospital, and in the ordinary course of his administration should not be interfered with, as, for example, by instructions being given to his subordinates, except through him personally. He is responsible directly to the Medical Officer of Health, through whom all instructions to the medical superintendent should pass, and through whom communications to the Public Health Committee should be made.

Clayton Hospital is not at present occupied, but is used for the treatment of cases of smallpox. It is at present cared for by three persons.

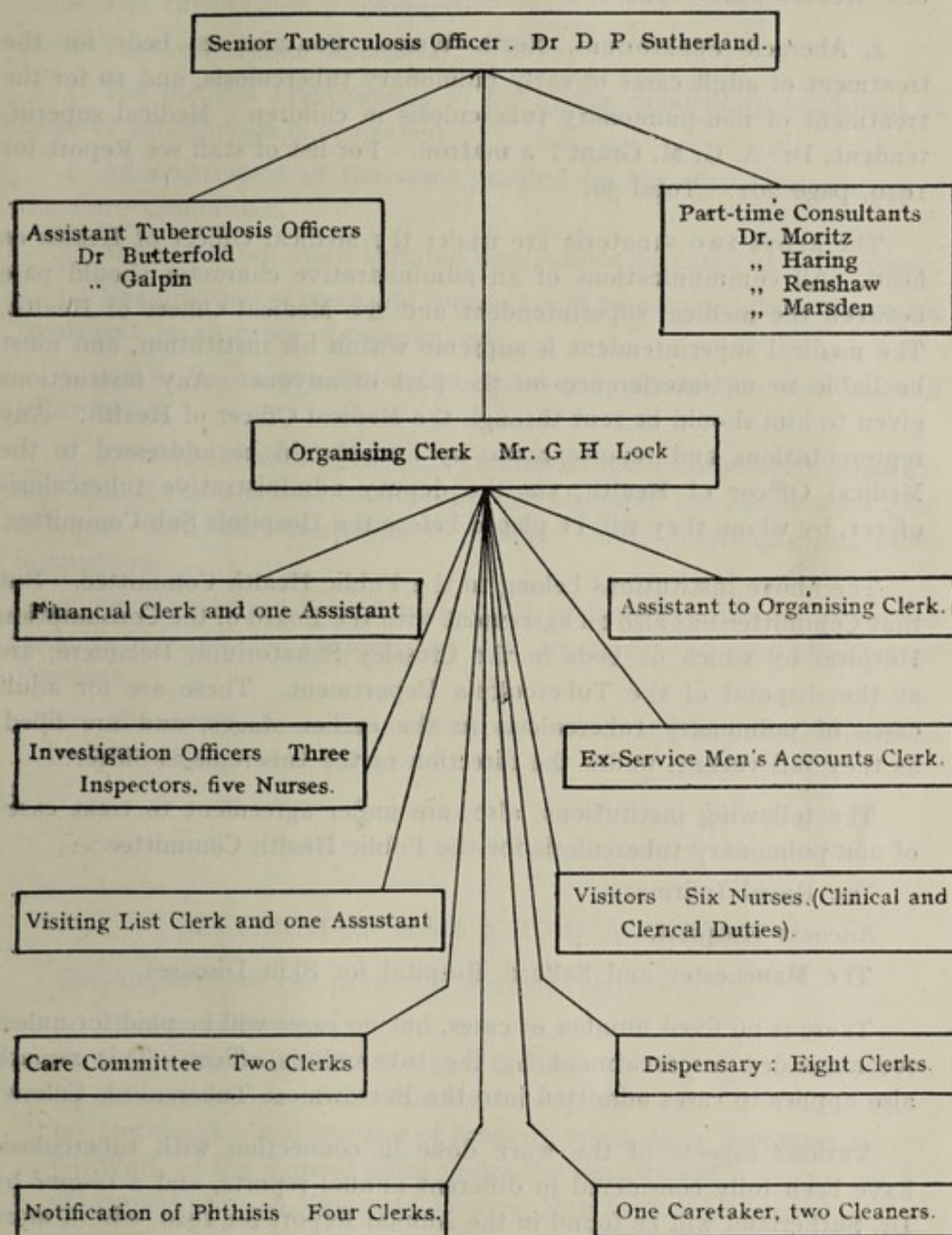
TUBERCULOSIS.

The Tuberculosis Medical Officer is Dr. D. P. Sutherland. By resolution of the Sanitary Committee he was appointed deputy administrative tuberculosis officer. As senior clinical officer he possesses in all clinical matters an independent position. The Medical Officer of Health is chief administrative tuberculosis officer. As senior clinical officer, Dr. Sutherland acts as consulting head to the Corporation sanatoria and to the practitioners of the City, and is solely responsible for the direction of treatment of individual cases. As deputy administrative tuberculosis officer he administers the various Acts, Orders, and Regulations dealing with tuberculosis on behalf of and in consultation with the Medical Officer of Health, who is directly responsible to the Public Health Committee.

As already explained, this position arises from the necessity of intimately co-ordinating the public health and clinical aspects of the work if success is to be attained in the whole field.

Dr. Sutherland's headquarters are at the Tuberculosis Offices, which at present are directly joined to the dispensary of the Consumption Hospital, and which, from the point of view of the Corporation and of the tuberculosis scheme, are the dispensary. At the Tuberculosis Office section of the dispensary, directly assisting Dr. Sutherland, are two assistant medical officers, and officially subordinate to him so far as the work which they do for the Corporation is concerned, four medical consultants, on the staff of the Consumption Hospital. The work of his office is carried out by a staff of clerks, visitors, and nurses, whose work is so arranged that the reports of the public health staff and of the clinical staff are made mutually to assist each other. The Care Committee's grants are investigated and administered under his supervision. As deputy administrative tuberculosis officer, all administrative communications from the medical superintendents of sanatoria are either sent to him and transmitted to the Medical Officer of Health; or, if received by the Medical Officer of Health, are sent by him to be dealt with, after consultation, if necessary.

The Dispensary section of the work is thus represented in 1921 :—



Total Staff, 45.

As deputy administrative tuberculosis officer, Dr. Sutherland has supervision over the various institutions. These comprise :—

1. Baguley Sanatorium, 319 beds. medical superintendent, Dr. Hugh Trayer ; three medical assistants ; a matron and assistant matron. For the list of the staff see the Medical Officer of Health's Annual Report or 1919, page 201. This institution is for the treatment of cases of

pulmonary tuberculosis not in an early stage: observation cases are also treated here. The total staff in 1919 numbered 111.

2. Abergele Sanatorium, North Wales. Contains 46 beds for the treatment of adult cases of early pulmonary tuberculosis, and 10 for the treatment of non-pulmonary tuberculosis in children. Medical superintendent, Dr. A. G. M. Grant; a matron. For list of staff see Report for 1919, page 201. Total 30.

The above two sanatoria are under the Medical Officer of Health as head. All communications of an administrative character should pass between the medical superintendent and the Medical Officer of Health. The medical superintendent is supreme within his institution, and must be liable to no interference on the part of anyone. Any instructions given to him should be sent through the Medical Officer of Health. Any representations and reports made by him should be addressed to the Medical Officer of Health, *via* the deputy administrative tuberculosis officer, by whom they will be placed before the Hospitals Sub-Committee.

The above institutions belong to the Public Health Committee. But that Committee has also an agreement with the Board of the Consumption Hospital by which 62 beds in the Crossley Sanatorium, Delamere, are at the disposal of the Tuberculosis Department. These are for adult cases of pulmonary tuberculosis in the earlier stages, and are filled, as they fall vacant, under the direction of the tuberculosis officer.

The following institutions, also, are under agreement to treat cases of non-pulmonary tuberculosis for the Public Health Committee:—

The Royal Infirmary.

Ancoats Hospital.

The Manchester and Salford Hospital for Skin Diseases.

There is no fixed number of cases, but no cases will be paid for unless recommended for treatment by the tuberculosis officer. This remark also applies to cases admitted into the Barrowmore Tuberculosis Colony.

Various aspects of the work done in connection with tuberculosis have been fully considered in different annual reports, and a *résumé* by Dr. Sutherland will be found in the Annual Report for 1920, with a more complete account in his answer to the *questionnaire* recently issued.

His sources of information in respect of cases of tuberculosis are—

1. The medical practitioners of the City.
2. His staff of investigators and nurses.
3. The medical institutions of the City, including the Union Hospitals and other institutions receiving Manchester patients.
4. The health visitors.
5. Other sections of the Public Health Office.

His administration embraces—

1. The tuberculosis dispensary.
2. The Corporation sanatoria.
3. The medical practitioners so far as the domiciliary treatment of cases of tuberculosis is concerned.
4. Administration of the sums granted by the City for purposes of the Care Committee.
5. Arranging for more suitable occupations in cases of tuberculosis.
6. Examination of cases and contacts, and recommendation of suitable treatment in all cases of tuberculosis.
7. Public health precautions to be taken in connection with cases of tuberculosis.
8. Recommendation of cases for treatment at the Corporation sanatoria and also at the Royal Infirmary, Ancoats Hospital, the Hospital for Skin Diseases, and the Barrowmore Colony; also informally at other institutions.
9. Dr. Sutherland has charge of all matters relating to ex-service patients referred for examination and treatment by the Ministry of Pensions.
10. He obtains from the sanitary inspectors and health visitors such assistance as may be required.

MATERNITY AND CHILD WELFARE.

This department comprises six sections, viz. :—

- (a) Health visitors. |
- (b) Maternity and Child Welfare Centres.
- (c) Administration of the Midwives Acts, 1902-18.
- (d) Notification and nursing of cases of ophthalmia neonatorum.
- (e) Work of the general office under the department.
- (d) Supervision of Maternity Homes, Manchester Act, 1921.

The head of the department is Dr. M. Douglas Drummond, appointed by the Committee in 1917 to be assistant to the Medical Officer of Health in charge of the department.

(a) The staff of health visitors is under Miss M. G. Seed. Their chief duty is to visit homes, on notification of a birth, and advise on the management of the infant, whose health they continue to watch until the child is of school age. They report when a child requires and should receive medical advice, and notify mothers when they should attend

a Maternity and Child Welfare Centre. All cases requiring medical advice are reported to Miss Seed, who takes such action as she thinks fit to secure the necessary medical service. They also visit and report on cases of measles, whooping cough, diarrhoea, pneumonia, and other diseases when called upon to do so. Their reports, or rather, by Dr. Ritchie's request, only the reports of those who at the end of the term of observation appear to require further observation, are forwarded to Dr. Ritchie.

A report on the work generally will be found in the Annual Reports for 1908 and 1916, and in other annual reports.

The number of the health visitor staff is: Superintendent of health visitors, Miss M. G. Seed; assistant superintendent, Miss Legge: 52 health visitors, 1 cleansing nurse, 7 clerks. Total, 62.

MATERNITY AND CHILD WELFARE CENTRES.

Of these there are 12 under the Maternity and Child Welfare Sub-Committee, and one Catholic centre, at which the medical services of the Corporation medical staff are given.

At these centres are held the consultations conducted by five medical assistants to Dr. Drummond, assisted by 13 qualified superintendents or their assistants, and by the voluntary workers of the School for Mothers. At present, nine of the centres are utilised for antenatal consultations, and two of these for venereal disease treatment. At six massage is given. One is used for dental treatment. In addition, the rooms are used by the School for Mothers for social classes. The centres are also used in connection with the milk scheme for supplying milk under medical prescription, fresh or dried, at reduced cost. Full details of the work done are given in the tables in the annual report dealing respectively with the milk scheme and the medical and nursing work.

The staff consists of 5 medical assistants; 13 superintendent nurses or assistants; 1 whole-time, 3 part-time masseuses; 3 milk clerks; 4 milk investigators; 6 full-time, 5 part-time cleaners. Total, 40, besides voluntary workers. The health visitors and superintendents of centres work in association.

Administration of the Midwives Acts, 1902 and 1918. A separate report on this subject will be found in the annual report. Under Dr. Drummond, the objects of these Acts are carried out by an assistant inspector of midwives, Miss Austin, and four nurses. The midwives are relieved by this staff of all need for quarantine on the occurrence

of sepsis, fever, or pemphigus neonatorum. Midwives are responsible for the health of the child during the first 10 days of life, and are then succeeded by health visitors. Total staff, 5.

OPHTHALMIA NEONATORUM.

The staff engaged on this work numbers 3 nurses.

The clerical work connected with the above services is carried out by 4 clerks in Dr. Drummond's office. Total persons in the Maternity and Child Welfare Department, 115.

THE VENEREAL DISEASES SCHEME.

The venereal diseases scheme was established in 1917 for the free treatment of cases of venereal disease, the expense of which to the extent of 75 per cent was to be defrayed by the Treasury. It embraced clinics at St. Luke's Hospital, the Royal Infirmary, Ancoats Hospital, and the Manchester and Salford Hospital for Skin Diseases. It was placed under Dr. W. A. Young on his return from service, and has since then been enlarged in various ways :—

1. A new ward was opened at St. Luke's Hospital, and increased facilities for ablution provided.
2. Arrangements were made at that hospital whereby men could get access to means of self-ablution at hours other than those of clinics.
3. Early-treatment centres, which, in my opinion, constituted a great advance in preventive treatment were established at two underground conveniences.
4. An intermediate treatment centre for female patients was established at Monsall Hospital, which has been a decided success.
5. Clinics were opened at St. Mary's Hospital, Whitworth Street.

The City Council during the present year decided to close the early-treatment centres.

To carry out the clinical duties, Dr. Young has the part service of a clerk, who will be credited to this section. A full report on the work carried out is given in the annual report, and in Dr. Young's reply to the *questionnaire*.

In addition to the office clerk, he has the full-time services of a nurse at Monsall Hospital, and part-time services of a medical woman. Total staff, 3.

He also has a portion of the time of two of the medical assistants to Dr. Drummond.

His work in connection with venereal diseases is chiefly supervisory and financial.

RATS AND MICE DESTRUCTION ACT.

This Act is also administered by Dr. Young.

To carry out the executive work he has the services of an executive officer, Mr. John Potts, D.S.O., and part time of the clerk attached to the venereal diseases section. Total, 1.

But for this section he also employs the staff of the Sanitary Department to carry out work, and in the destruction of rats he obtains assistance from other departments of the Corporation.

For his general work as assistant to the Medical Officer of Health Dr. Young obtains his clerical assistance from the Public Health Office, and from the health visitors' section.

THE SANITARY DEPARTMENT (MR. H. DALE).

This section of the work is so clearly interwoven with that of the medical officers in many ways, that no complete separation is possible—at all events, so far as the work of the district inspectors, and that of the inspectors under the Sale of Food and Drugs Acts, is concerned. Indeed, no separation is desirable. In fact, it is one of the great advantages of the Committee's resolution, that the Medical Officer of Health can now direct the whole power of the establishment to any emergency occasion which may arise.

This department transacts or supervises the whole of the routine work of the Medical Officer of Health, so far as concerns the arrangements made for the removal of cases of infectious disease and for disinfection, investigation and dealing with nuisances, the sampling of foods under the Sale of Food and Drugs Acts, other Acts, and for other purposes; the framing of notices and specifications, and the taking out of summonses in cases of nuisance, the inspection and certification of houses as unfit for human habitation, procedures under Section 28 of the Housing, Town Planning Act, 1918, inspection of dairies, cowsheds,* and milkshops under the Orders pertaining and local regulations, the taking of observations and court proceedings for smoke nuisances, the inspection of factories and workshops, administration of the Shop Hours Act, the examination of drains and supervision of drainage work, the supervision of houses let in lodgings, administration of the municipal lodging-houses*, the administration of local Acts and regulations dealing with ice cream manufacture, regulations as to the proper storage and removal of horse manure, the Fabrics Misdescription Act, the Rag Flock Act, and other subjects.

* This work has been transferred to Lieut.Col. Brittlebank, who has the services of the Staff of the Sanitary Department.

Sanitary Department: Its Constitution and Numbers.

Mr. H. Dale.

Chief Clerk and Cashier ;
H. Beckett.

Chief Inspector :
W. Stansfield.

Senior Clerk :
A. H. Worsley.

General Office :	Shorthand and	Municipal	Public
1 Magistrates'	Typewriting Offices:	Lodging Houses :	Conveniences :
Summons Statistical	1 Chief Shorthand	1 Manager.	1 Foreman.
Clerk.	and Correspondence Clerk.	1 Assistant.	1 Assistant.
1 Assistant do.	3 Assistants.	37 Staff.	1 Lady Supervisor.
1 Wages, etc., Clerk.		1 Manageress.	30 Male Attendants.
4 Divisional Clerks.—		10 Staff.	22 Female Attendants.
12 Clerks.	4	—	ants.
—		50	12 Urinal Cleaners.
19			67
2 Messengers, 1 Capetaker, 1 Door Porter, 6 Women Cleaners—10.			

District Inspectors
and Assistants :
38.

8 Special Inspectors :
1 Chief Smoke and
Chemical In-
spector.
3 Food and Drugs
Inspectors.
3 Smoke Inspectors.
4 Lodging House
Inspectors.
2 Milkshop Inspectors.
1 Canal Boats Inspector.

Drainage
Enquiry Office :
1 Chief Drainage
Inspector.
3 Drainage In-
spectors.
4 Drain Examiners.

Factories, Work-
shops, and Shops
Department :
8 Male Inspectors.
2 Female Inspectors.
5 Clerks.

221
10

Total Staff : 231

A New Statistical Department

1891

Chief Clerk and Auditor
H. J. Smith

General Office	1
Statistical Office	2
Administrative Office	3
Legal Office	4
Engineering Office	5
Medical Office	6
Pharmaceutical Office	7
Chemical Office	8
Physical Office	9
Biological Office	10
Geographical Office	11
Historical Office	12
Philosophical Office	13
Artistic Office	14
Scientific Office	15
Library Office	16
Printing Office	17
Post Office	18
Telegraph Office	19
Telephone Office	20
Steamship Office	21
Railroad Office	22
Maritime Office	23
Air Office	24
Land Office	25
Water Office	26
Fire Office	27
Police Office	28
Justice Office	29
Education Office	30
Religion Office	31
Charity Office	32
Health Office	33
Food Office	34
Clothing Office	35
Housing Office	36
Transportation Office	37
Communication Office	38
Energy Office	39
Materials Office	40
Manufacturing Office	41
Commerce Office	42
Finance Office	43
Banking Office	44
Insurance Office	45
Real Estate Office	46
Public Works Office	47
Public Health Office	48
Public Safety Office	49
Public Education Office	50

Published by the Department of Statistics, 1891

Perhaps the best way to get an impression of the work carried on by the Sanitary Department is to run over any of the reports annually issued by the Public Health Committee.

A brief and good *résumé* of the duties is given by Mr. Dale in the *questionnaire*, which will serve to supplement the annual reports of the Public Health Committee.

To fulfil the various purposes shown in the annual report referred to the sanitary section has a staff of 231 persons classified by Mr. Dale as follows. The classification is itself a description of the work carried on by the Sanitary Department.

MILK SECTION.

The section dealing with the control of our milk supplies is under Lieut.-Col. J. W. Brittlebank, C.M.G. He has charge of the following divisions of the work:—

(a) The administration of the Manchester Milk Clauses, which have for their primary object diminution in the quantity of tuberculous milk arriving or arising in the City, and incidentally the establishment of cleaner conditions of production. He should work in intimate co-operation with the Tuberculosis Department. A statement on this subject will be found in every Annual Report of the Medical Officer of Health since 1900.

(b) The control of dairies, cowsheds, and milkshops, and of the conditions under which milk is produced and sold within the City. This section has been recently added to his duties.

(c) The systematic inspection of milch cows within the City.

(d) The supervision of ice cream manufactories as governed by provisions in a Local Act, and by directions drawn up for the conditions under which ice cream is produced.

(e) Control of sampling under the Sale of Food and Drugs Act, and under the milk and cream regulations, 1912.

Owing to the serious illness of one inspector, and the partial disablement of another, it was recently found necessary to carry out (b) and (d) by the general body of the sanitary inspectors as a temporary measure. As a permanent policy, this is a bad arrangement. It is not possible for Lieut.-Col. Brittlebank to exercise proper supervision over the general body of district inspectors, or to secure uniformity of treatment. What is required is a proper executive of at least two active inspectors, responsible to him. Supposing it were possible to maintain control over the general body of inspectors, it could only be at the expense of much interference with their general duties.

To carry out effectively the various duties mentioned, a good clerk is absolutely necessary. Present staff, March 31st, 1922, Lieut.-Col. Brittlebank, 1 clerk, and 2 inspectors. Total, 4.

The Public Analyst is officially subordinate to the Medical Officer of Health, who is responsible for the samples submitted to him. Total, 1.

THE WORK OF THE HOUSING MANAGER.

The Housing Manager, Mr. John Irvine, is an officer of the Public Health Committee, and by the resolution of the Public Health Committee would become a subordinate to the Medical Officer of Health. However, he is regarded as under two official heads, the City Architect and the Medical Officer of Health. The section which is under the City Architect is that of unhealthy dwellings, which is in a specially intimate relation with the Medical Officer of Health. The Medical Officer of Health initiates, or should initiate, action in respect of unhealthy dwellings, and should certainly consider beforehand all plans submitted for their improvement or removal.

It seems to me that it would simplify the position if the Housing Manager were definitely placed under the Medical Officer of Health, or at the least if the classification drawn up by Mr. Irvine were officially sanctioned.

Mr. Irvine is a very able official, whose work is admirably done, and it is out of no spirit of criticism that these remarks are made.

The amount of work which he controls is most extensive. *Inter alia*.

1. He prepares all schemes in connection with (a) houses unfit for human habitation; (b) repairs to be carried out under the Housing, Town Planning Act, 1919; (c) provides plans and specifications in respect of food-preparing places, bakehouses, ice cream establishments, cowsheds, dairies, restaurants, etc.; (d) plans for means of escape in case of fire at factories and workshops; (e) plans for W.C. accommodation at factories and workshops; (f) schemes out the alteration of premises for Maternity and Child Welfare Centres, and other plans as required.

2. He is responsible for the upkeep and repair of all housing schemes, past and recent; also of the hospitals belonging to the Corporation, and of the municipal lodging-houses.

3. Is in charge of a painting and repairs department for the above purposes.

4. Is the repository of all plans executed in the past for the Public Health Department, and has the work excellently classified and exhibited. (For a full description of his work, see his statement of work prepared for the *questionnaire*.)

Public Health Committee, Housing and Unhealthy Dwellings Department

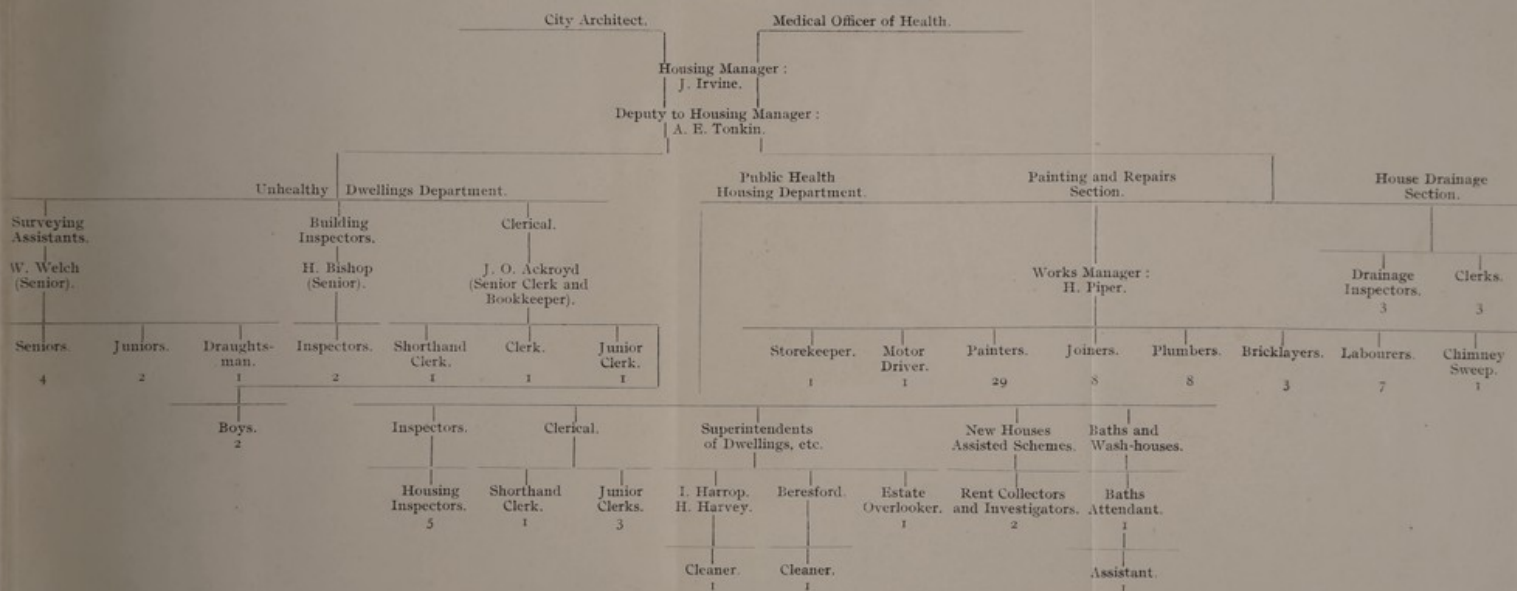
SUMMARY OF DUTIES

CITY COUNCIL

Public Health Committee

Public Health Committee, Housing and Unhealthy Dwellings Department.

ADMINISTRATIVE SCHEME OF DEPARTMENT.



Public Health Committee, 1904

Report of the Committee on the

Sanitary Condition of the City of New York

for the Year 1904

Presented to the Board of Health

at its meeting on the 10th day of

January, 1905

by the Committee on the

Sanitary Condition of the City of New York

for the Year 1904

Presented to the Board of Health

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at its meeting on the 10th day of

January, 1905

5. He supervises, for the Medical Officer of Health, the work of five inspectors employed in carrying out the Housing Regulations, 1910, and has charge of the card index belonging. From these, he furnishes monthly statements for the purposes of the Housing, Town Planning Act, 1919, Section 28.

Attached are copies of his classification of that part of the work of his department, which is carried out for the Public Health Committee, from which it would appear that, including himself and his deputy, there are engaged in work officially under the Medical Officer of Health, in all, a staff of 85. (City Architect, 17.)

It is certain that without the work of Mr. Irvine and his department nothing approaching the progress made in many departments of public health work could have been achieved.

The following is a summary of the staff employed in 1921 in the Public Health Department, under the Medical Officer of Health—

Medical Officer of Health, assistant medical officers, and Office	20
Monsall Fever Hospital	215
Tuberculosis—	
Medical Officer and Dispensary	45
Baguley Sanatorium	111
Abergele Sanatorium	30
Maternity and Child Welfare—	
Dr. Drummond	1
Health visitors	62
Maternity and Child Welfare Centres	40
Midwives Acts	5
Ophthalmia neonatorum	3
General office clerks	4
Venereal Diseases Scheme	3
Rats and Mice (Destruction) Act	1
Sanitary Department (Mr. Dale)	231
Veterinary and milk section	4
Housing manager (Medical Officer of Health section) ..	85
Public Analyst	1
<hr/> Total	<hr/> 861

This outline is intended to give merely an idea of how the various branches of work under the Medical Officer of Health are constituted. It is, therefore, necessary to supplement it in various respects, by giving references to accounts of the work, so far as these are available.

For the most part they are to be found in the replies to the *questionnaire* sent in by the various sub-heads of sections, supplemented in the annual reports of the Medical Officer of Health.

1. A full statement is given by me in my answer to the *questionnaire* of the various departments supervised by the Medical Officer of Health.

2. This is also the case in the answers to the *questionnaire* given by Dr. D. P. Sutherland.

3. Dr. W. A. Young, in his replies, gives a full account of the venereal diseases section, and of the administration of the Rats and Mice (Destruction) Act.

4. An introductory summary is given by Dr. Drummond, but this is not so full as some of the other statements. On the other hand, in my answers to the *questionnaire*, I have gone into more detail in this part of the work, and historical statements will be found as regards—

(a) *The Midwives Act, 1902*.—Reports on this Act and on its administration will be found in my Annual Reports for 1904, 1905, 1906, and in subsequent reports.

(b) *Ophthalmia Neonatorum*.—An account of the steps leading up to the adoption of notification, and also of the action taken as the result of notification, is given in the Annual Report for 1910. This administration was carried out by Dr. Barbara Cunningham, and subsequently by Dr. Douglas Drummond.

(c) A statement on health visitors is given in the Annual Report for 1908.

(d) The history of the Maternity and Child Welfare movement, and of the taking over of their centres from the School for Mothers, is given in the Annual Report for 1916.

But, in addition to these, there are numerous other descriptive sections in the annual reports.

This applies still more to tuberculosis.

(e) Scheme for the distribution of milk under cost. (See Annual Report for 1918, pages 71-90.)

MISCELLANEOUS.

The above summary of the activities of the Medical Officer of Health's Department it will be seen relates purely to the Public Health Department of the City of Manchester. It is proper to point out, however, that Manchester and the country generally owes much to Professor Delépine, both as an investigator and as a teacher. To Sir Arthur Newsholme, K.C.B., also, in his position of Chief Medical Adviser,

to the Local Government Board, is to be attributed the inclusion of tuberculosis amongst infectious diseases, and the great strides in the administrative measures for dealing with infant mortality, and with the care of young children generally.

In what I have attempted to do, I have had the advantage of an able succession of medical assistant officers, and the aid of many excellent officers in the Public Health Department. It would be impossible to enumerate them all, but I might mention particularly Mr. R. M. Rowe, Mr. Hewitt, Mr. G. H. Lock, Mr. Roos, Mr. Dunks, Mr. Priestley, and my three special inspectors, with Mr. John Irvine. I am also much indebted to my fellow officials.

But, in public affairs, it is the governing body that largely determines the impress which is ultimately made on the course pursued, and the Sanitary Committee must therefore share with me in the credit which attaches to public health during the last 28 years, if there is credit, and in the discredit if the results are not as great as they should have been.

The subdivision of the work of the Public Health Committee under sub-committees may, to some extent, convey an idea of how the work is carried on. There are:—

1. *Audit Sub-Committee.*
2. *Hospitals Sub-Committee—*
 Disease generally.
 Tuberculosis.
 Venereal disease.
 Hospitals.
3. *Maternity and Child Welfare Sub-Committee.*
4. *Nuisance Sub-Committee—*
 Nuisances generally.
 Smoke nuisances.
 Offences in respect of houses let in lodgings.
 Offences under the Sale of Food and Drugs Acts.
 Closure of houses in certain cases.
 Rats and Mice (Destruction) Act, etc.
5. *Shops, Workshops, and Lavatories Sub-Committee—*
 Offences against the Shop Hours Act.
 Offences under the Factory and Workshop Acts, including provision of escape in case of fire.
6. *Housing and Unhealthy Dwellings Sub-Committee—*(Operations at present largely suspended).
7. *Municipal Lodging-houses Sub-Committee.*
8. *Air Pollution Advisory Board—*(A research sub-committee).
9. Other sub-committees for temporary purposes.

STATISTICAL.

Few statistical tables appear to be required, as Table E of the Annual Report for 1921 shows the history of the death rates from infectious disease since 1871 in quinquennial periods, and also gives the number of deaths per 1,000 births for the same period. This summary is hereby given.

TABLE E.—MANCHESTER—ESTIMATED POPULATIONS. ANNUAL RATES OF MARRIAGES, BIRTHS, AND DEATHS (a) FROM ALL CAUSES, (b) FROM SPECIFIED CAUSES, AND (c) INFANTILE MORTALITIES; ALSO THE PERCENTAGES TO TOTAL DEATHS OF INQUEST CASES AND OF DEATHS IN PUBLIC INSTITUTIONS; ALSO QUINQUENNIAL AVERAGES, 1871-1920.

Year.	Estimated Population. (Mean).	Persons Married.	Annual Rates per 1,000 persons living.											Percentage to Total Deaths.		Infantile Mortality.	Year.	
			Births.	Deaths (all causes).	Smallpox.	Measles.	Scarlet Fever.	Diphtheria.	Whooping Cough.	Typhus Fever.	Enteric Fever.	Simple Continued Fever.	Diarrhoeal Diseases.	Violence.	Inquest Cases.			Deaths in Public Institutions.
1871-1875	477,344	24.6	38.9	28.3	0.26	0.64	1.08	0.08	0.78	0.14	0.43	0.21	1.95	0.94	7.2	13.4	198	1871-1875
1876-1880	509,802	18.6	38.7	26.2	0.24	0.53	1.07	0.13	0.84	0.08	0.29	0.11	1.26	0.89	7.5	14.3	172	1876-1880
1881-1885	542,746	17.9	35.1	23.6	0.04	0.71	0.48	0.10	0.68	0.05	0.20	0.03	0.99	0.72	7.0	15.9	175	1881-1885
1886-1890	575,630	16.6	33.4	24.6	0.02	0.83	0.50	0.32	0.54	0.02	0.30	0.01	1.08	0.78	6.9	17.7	183	1886-1890
1891-1895	517,801	16.9	33.2	23.6	0.03	0.62	0.26	0.27	0.64	0.00	0.24	0.01	1.19	0.77	7.1	19.2	186	1891-1895
1896-1900	539,599	18.2	32.5	22.7	..	0.89	0.20	0.13	0.53	0.00	0.18	0.01	1.69	0.73	7.1	20.2	192	1896-1900
1901-1905	554,355	17.4	30.9	20.1	0.01	0.55	0.19	0.22	0.41	0.00	0.13	0.00	1.15	0.72	7.1	24.4	173	1901-1905
1906-1910	660,049	17.0	28.1	17.7	..	0.54	0.16	0.17	0.37	0.00	0.10	0.00	0.76	0.68	7.4	27.3	147	1906-1910
1911-1915	731,677	17.6	24.8	16.4	..	0.50	0.12	0.14	0.25	..	0.05	..	0.84	0.67	7.9	30.8	133	1911-1915
1916-1920	770,330	16.7	19.2	14.1	..	0.24	0.04	0.08	0.21	..	0.02	0.00	0.30	0.49	6.4	32.3	105	1916-1920

QUINQUENNIAL AVERAGE.

The populations and rates prior to 1891 are those for the Unions of Manchester, Chorlton, and Prestwich, which have been taken to approximately represent "Manchester." The City was extended to include Moss Side and Withington in November 1904, to include Gorton and Levenshulme in November, 1909, and now nearly coincides in area with the three Unions.

The statistics for 1911-15 and 1916-20 are comparable with those for 1871-75, 1876-80, 1881-85, 1886-90, as they relate to approximately the same area. Those of the intervening period relate to a much smaller area, and especially those of 1891-1905. It is scarcely necessary to point out the great reduction, over the long period since 1871, in the death rates from scarlet fever, smallpox, and typhoid fever.

But attention may be drawn to the reduction in the last quinquennium of the death rates from measles, whooping cough, diphtheria, and diarrhoea. This is to some extent due to the falling birth rate, especially in the case of whooping cough and diphtheria. The fall in respect of measles is too great to be thus accounted for. It is largely due to the work of the health visitors.

From Table F we see the history since 1881, so far as concerns death rates, of a more general group of disease conditions. A summary in five yearly periods is given below.

TABLE F.
MANCHESTER—ANNUAL RATES OF MORTALITY FROM CERTAIN CAUSES OF DEATH.

YEAR.	ANNUAL RATES PER 1,000 PERSONS LIVING.										RATES PER 1,000 BIRTHS.	
	Cancer.	Tuberc. Peritonitis Tabes Mes.	Phthisis.	Other Tuberc. Diseases.	Diseases of Nervous System.	Diseases of Heart and Blood Vessels.	Diseases of Respiratory System.	Diseases of Digestive System.	Diseases of Urinary System.	Diseases of Generative System.	Puerperal Fever.	Childbirth.
1881-1885	0.50	0.35	2.42	0.57	3.28	1.37	5.41	1.23	0.48	0.08	3.03	1.99
1886-1890	0.64	0.36	2.24	0.59	3.09	1.73	5.76	1.23	0.61	0.08	3.22	2.13
1891-1895	0.62	0.22	2.09	0.75	1.75	2.53	5.56	1.07	0.52	0.07	2.75	3.42
1896-1900	0.73	0.19	2.04	0.63	1.32	2.54	5.03	1.04	0.49	0.09	1.55	1.51
1901-1905	0.80	0.16	1.94	0.55	1.17	2.56	4.29	0.95	0.49	0.08	1.21	1.76
1906-1910	0.88	0.14	1.65	0.45	0.95	2.56	3.75	0.84	0.54	0.07	1.28	1.49
1911-1915	1.01	0.12	1.59	0.38	0.79	2.34	3.45	0.68	0.09	0.09	1.24	2.14
1916-1920	1.08	0.09	1.39	0.28	0.54	2.27	2.98	0.51	0.47	0.06	1.58	1.82

See footnotes to Table E.

We note the continued ascent of the death rate from cancer, due largely to the prolongation of life owing to improved sanitary conditions.

A great descent has occurred in respect of tuberculosis of the lungs, and other respiratory diseases. The fall under tuberculosis is exceptionally great in respect of the section of non-pulmonary tuberculosis, which may be assumed to be more particularly associated with the consumption of tuberculous milk. This death rate has shared the advantage of the efforts to reduce human infection with the advantage of the efforts to reduce the amount of infection from tuberculous milk.

Marked falls are notable under diseases of the nervous system, and diseases of the digestive system. Both falls may be assigned in a large measure to the work of the health visitors, the former improvement occurring under convulsions, which is largely of digestive origin.

There is no fall of any considerable amount under circulatory disease, under urinary diseases, or under diseases of the generative system. Nor is there any fall under puerperal fever and accidents of childbirth—an unsatisfactory condition of affairs. From other statistics it appears that in 1921 the death rates had increased from sepsis generally—a special scourge of Manchester.

Nevertheless, the general death rate is the lowest on record.

It should be stated that the statistical tables appended to the Annual Reports are those originally drawn up by Dr. Tatham.

Dr. Tatham has represented the facts of the death rate in the form of a life table for Manchester as constituted in 1891 for 1881-90. This shows them under the shape of the expectation of life. I constructed a short life table for the years 1901-1910, which enables a comparison of the expectation of life in the Manchester of 1891 for those ten years, to be made with the expectation of life at different ages given in Dr. Tatham's extended tables for 1881-90.

The work was carried out with a table of logarithms, and was therefore very laborious.

If it is desired to have a similar table, say, for the years 1920-23, no doubt the work could be done at a moderate expense in the Registrar-General's Office.

I attach the life table in question, which has not been published, and which is explained so far as explanation seems necessary. It is manifest that the expectation of life has now greatly increased. Even in that period of comparatively slow progress, the increase in expectation of life was very great.

A SHORT LIFE TABLE FOR THE CITY OF MANCHESTER AS EXTENDED IN
THE YEAR 1890, FOR THE TEN YEARS 1901-10, PERSONS
(MALES AND FEMALES).

A life table as constructed for a provincial town has not so much value as that for the whole country, inasmuch as the mean populations are much more affected by the conditions prevailing at the census periods, while the mortality rates fluctuate to a much greater extent than they do for the whole of England and Wales.

The local industrial conditions also determine a distribution of the population in age groups much less in accord with natural graduation than that which prevails for the whole country, a circumstance which somewhat impairs the regularity in decline of the life table population.

Notwithstanding, it is generally considered that the life table presents the facts of mortality in another and perhaps more interesting manner than do the death rates. Death rates show the force of mortality. A life table exhibits the expectation of life ; but the meaning is essentially the same, and all the anomalies pertaining to local experience affect the one as they do the other.

A life table for Manchester for the years 1901-10 proposes to show what will be the future of 100,000 children born, who experience throughout life the rates of mortality, and therefore the sanitary conditions, prevailing in Manchester in the 10 years under consideration. The extent to which it is an index of sanitary conditions depends on the extent to which rates of mortality can ever be considered an index of sanitary conditions. Starting with a given number, say 100,000 at birth, it shows how many will survive at the commencement of every five years of their subsequent life. The expectation of life at any age is the average number of future years of life enjoyed by those who reach that age, and is found by adding up all the future years of life lived and dividing the number by the number of persons entering the age in question. The present life table has been constructed according to a scheme set forth by the late Dr. T. E. Hayward, which was published in the *Journal of Hygiene*, January, 1905. The method was shown by Dr. Hayward to give results closely according with those of extended life tables constructed in the ordinary manner, and before the construction of the present life table was started ; this statement was verified by him by comparison of an experimental life table for Manchester males for the years 1881-90.

The present life table is for persons, and not for males and females separately. With these preliminaries, the life table is now submitted, the corresponding life table by Dr. Tatham for the years 1881-90 being placed side by side with it for purposes of comparison.

The chief points of interest are :—

1. That 100,000 children born and living under the law of mortality prevailing in 1901-10 would enjoy 558,519 years of life more than 100,000 children would if born and living under the law of mortality prevailing in 1881-90.
2. Half the children, according to the life table of 1901-10, would not have ceased to live until after the age of 50, while, according to the life table of 1881-90, half would have died about the age of 41.
3. The greatest expectation of life in the table of 1881-90 was at age five. In the present life table the maximum recedes to age three.
4. The excess of the expectation of life in the life table for 1901-10 over that for 1881-90 does not cease until between the ages of 80 and 85 ; while the excess in the number of survivors does not cease till after the age of 95.

LIFE TABLES FOR MANCHESTER PERSONS.

1901-10.—Manchester of 1891.			1881-90.—Manchester, of 1891.		
Ages.	Number surviving at ages below.	Expectation of life.	Ages.	Number surviving at ages below.	Expectation of life.
0	100,000	42.13	0	100,000	36.54
1	82,934.6	49.81	1	82,382	43.28
2	77,747.3	52.10	2	75,478	46.20
3	75,766.3	52.45	3	72,745	46.90
4	74,553.5	52.29	4	71,030	47.03
5	73,696.6	51.89	5	69,814	48.13
10	71,912.7	48.13	10	66,439	44.11
15	70,938.7	43.75	15	64,818	40.15
20	69,732.9	39.47	20	63,404	35.99
25	68,190.9	35.30	25	61,444	32.95
30	66,279.3	31.24	30	58,706	28.43
35	63,737.7	27.39	35	55,223	25.06
40	60,351.1	23.77	40	51,096	21.88
45	56,124.4	20.31	45	46,386	18.84
50	50,956.9	17.25	50	41,067	15.95
55	44,495.6	14.34	55	35,042	13.25
60	36,833.8	11.79	60	28,281	10.82
65	28,441.0	9.52	65	21,002	8.69
70	19,876.1	7.55	70	13,836	6.92
75	12,031.6	5.89	75	7,738	5.52
80	5,926.0	4.53	80	3,501	4.40
85	2,182.7	3.44	85	1,222	3.56
90	539.6	2.57	90	316	2.94
95	78.3	2.16	95	59	2.48
100	5.7	..	100	8	..
105	..	..	105	0	..

In conclusion, I should be glad to think that this summary of effort may be of some use. Every period requires its own adaptations, and presents its own problems. The following brief statement mentions some of those

matters which have been left incomplete, or have appeared to me objects to be attained :—

1. An adequate disinfecting station is required.
2. A smallpox hospital is also required which should be so situated as to be well separated from dwellings, and should be so constructed and situated as to serve also as a tuberculosis hospital.
3. Increased activity is needed in removing sepsis. For that reason the tipping of organic undestructed matter within the City should be abandoned.
4. The effort already carried on for a number of years to prevent the breeding of houseflies should be strenuously pursued to completion.
5. Increased effort should be bestowed on places engaged in the making of foods and drinks, on restaurants, cafés, etc., with a view to protect the public from contaminated foods.
6. The investigation of pneumonia from the clinical and public health sides requires attention, but should only be attempted with the aid of a highly-qualified medical investigator.
7. Manchester and Salford should unite their forces. Acting separately they hamper each other, and the problems of the immediate future require their combined action.
8. The supervision of foods, the cleansing of the City, and the School Medical Service should be part of a unified Public Health Service.
9. No Public Health Service can be successful without the co-operation of the Medical Profession, to whom I tender my gratitude for their constant support.

masters which have been left unprotected, or have appeared to me objects to be retained:

1. An adequate disinfecting station is required.
2. A smaller hospital is also required which should be so situated as to be well separated from dwellings, and should be so constructed and situated as to serve also as a tuberculosis hospital.
3. Increased activity is needed in removing refuse. For that reason the tipping of organic unrefined material within the City should be abandoned.
4. The effort already made on for a number of years to prevent the breeding of mosquitoes should be strenuously pursued to completion.
5. Increased effort should be bestowed on those engaged in the marketing of food and drink, on restaurants, cafes, etc., with a view to protect the public from contaminated food.
6. The investigation of pneumonia from the clinical and public health sides requires attention, but should only be attempted with the aid of a highly qualified medical investigator.
7. Manchester and Salford should unite their forces. Acting separately they hamper each other, and the progress of the immediate future requires their combined action.
8. The supervision of food, the cleaning of the City, and the School Medical Service should be part of a unified Public Health Service.
9. No Public Health Service can be successful without the co-operation of the Medical Profession, to whom I tender my gratitude for their constant support.

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