In discussing the influence of the infectious diseases upon child welfare the main points to be considered are the mortality for which they are responsible and the sequelæ which follow in their train. The pedagogue might add a third point: the time which these diseases may subtract from the period of education. Personally, I think that there must be very few children, especially of the poorer classes, who are not benefited by the mental rest enforced by a mild attack of scarlet fever or diphtheria, and I believe that the lost time is usually made up very rapidly.

If we disregard this last consideration, then, and limit our attention to the diseases which show a casualty list of what might be described as "killed" and "wounded," we at once exclude from our discussion those minor infectious ailments such as chicken-pox, rubella, and mumps, which are merely responsible for a long list of "missing" from school. I will merely remark that the hospital isolation of such cases, when practicable, should be encouraged if only to give the children of the slums the benefit of the good air, the liberal and wholesome feeding, and, perhaps most important of all, the early and regular hours which internment in the average modern fever hospital entails.

As regards the more serious infectious diseases they fall naturally into two groups: those which, like the poor, may be said to be always with us, and those which may be described as occasional visitors. Into the first group such diseases as scarlet fever, diphtheria, measles, and whooping-cough, all of which are seldom absent in great cities, will naturally fall. Enteric fever need hardly be considered. In Edinburgh it is a dying disease, and latterly has not affected more than a dozen children annually.
It is not, moreover, a very serious illness in children, and our case death-rate for those of under ten years of age is not more than 6 per cent., the period from ten to fifteen years showing the still lower mortality of 3 per cent.

If enteric fever is moribund in this city, typhus fever, which may be classed with the group of infectious diseases which occur occasionally, may be said to be absolutely dead. Here, again, my experience has been that it is not very fatal to children. On the contrary, it is almost always benign, and there appears to be no use to consider it. It is different with cerebro-spinal fever, which of late years has been more common in the city, and which has shown two distinct periods of moderate prevalence in 1907-8 and in the last two years. Its high fatality-rate is well known, and it is especially fatal in infants. In the 1907 outbreak we lost no fewer than twenty out of twenty-one infants under one year of age. After the age of two years the case death-rate becomes considerably less, and children of over five often do comparatively well. But the outlook as regards the treatment of this disease is hopeful. Antitoxic serum is beginning to give very fair results, and the fact that the dissemination of the infection by healthy carriers is now well understood and that the bacteriology of the disease, with all respect to the somewhat disturbing views recently expressed by Hort, is fairly established, leads us to hope that if, as is probable, we are to expect a greater familiarity with this dangerous disease in the future, we shall be reasonably well equipped for dealing with it both administratively and therapeutically. It should be remembered, however, that cerebro-spinal fever is one of the diseases which is formidable in its sequelae as well as in its death-rate. Nerve deafness is not uncommon, and epidemic prevalence of the fever has been said to increase the rate of admissions into asylums for deaf-mutes. Permanent blindness may also result, and varying degrees of hydrocephalus are also observed. But it is reassuring to know that serum treatment has very much reduced the number of these accidents, notwithstanding the greater proportion of patients who survive an attack. And this, I think, points the moral that, when bacteriological research has explained the causation of diseases like scarlet fever and measles, similar improvement in the incidence of their sequelae will be observed. Poliomyelitis is another occasional visitor which is chiefly to be dreaded on account of its incurable sequelae. Research here may also give important results.

Smallpox is the only other infection in this group of diseases
which requires mention, and to some it may appear that even mention is unnecessary. But it must never be forgotten that in the days before vaccination the age-incidence of the disease was much as is that of measles to-day, and in recent epidemics in insufficiently vaccinated towns the children have suffered most. In Gloucester, where the vaccination default had reached the astonishing level of 85 per cent., no less than 64 per cent. of the patients were under ten years of age. And it is well to remember that vaccination default in Edinburgh is increasing. Some recent small outbreaks in the South have only been limited by the most strenuous public health work, and in less skilful and energetic hands such an outbreak as that at Bristol a few years ago could hardly have failed to become a great epidemic. The one good feature in the outlook is the fact that the adult male population of the country has been for the first time in its history compulsorily revaccinated by the war, and that this is a great protection no one can deny. None the less, I do not think that any recommendations on child welfare can be complete if they do not include a strong representation in favour of really compulsory vaccination, and also compulsory revaccination on leaving school, as the rational means of protection against this very fatal and disfiguring disease.

We now must consider what, after all, are the important diseases: those that are practically endemic in all large communities. The public appears to regard measles and whooping-cough as trivial and diphtheria and scarlet fever as serious. How far is this attitude correct?

Scarlet fever was still a dangerous disease in the middle of last century, but its virulence has steadily declined, though its prevalence is probably as great as ever. In Edinburgh during the last few years, although very prevalent, it has only been responsible for about 0·12 deaths per 1000. Quite possibly it may once more become virulent, but in the meantime it is one of the milder infections, and its case death-rate in hospital seldom exceeds 3 per cent. and has been as low as 1·2 per cent. Its greatest incidence is in the second five years of life, and the sixth year provides the greatest number of cases. The highest mortality, however, occurs in the first quinquennium. Susceptibility to the fever decreases as age advances.

Diphtheria is of course justly dreaded, but since the introduction of serum treatment and bacteriological aids to diagnosis it has become much less formidable than it was. In 1914, when the
disease was at once more prevalent and more virulent than we are accustomed to in Edinburgh, it was only responsible for a mortality of 0.29 per 1000 and a case death-rate in hospital of 10 per cent. Of late years we have been accustomed to case death-rates of 6 or 8 per cent., and in one year it was as low as 4 per cent. As regards age it is most common in the first ten years of life, and particularly from two to five years. It is also most fatal in young children.

If we turn to measles we find that in the years when it is most prevalent it causes such mortality-rates as 0.41, 0.40, and 0.37 per 1000, and even when the outbreaks are small 0.17 per 1000 is the lowest rate in the last ten years in Edinburgh. It is to be noted that this lower figure is higher than that of scarlet fever. And that this is not entirely due to the fact that in a measles epidemic much greater numbers of individuals are affected than is the case with scarlet fever, is shown by the fact that the case death-rate for the last nine years the disease was notifiable in Edinburgh was 3.25 per cent. This, even, is an obvious understatement, as the notifications included many cases of rubella, and 4 per cent. would be probably a fair figure. During the same period this percentage was only once exceeded by scarlet fever. Measles is most common and most fatal in the first five years of life, and is particularly dangerous in children of under two years of age.

Whooping-cough much resembles measles in its age-incidence and in its destructiveness. It causes even a higher mortality-rate per 1000, such figures as 0.57, 0.40, 0.51, 0.37, and 0.35 occurring in recent epidemic years. It is, then, the most destructive of these four common diseases. As there is no notification we cannot calculate the case death-rate. It has been estimated at under 5 per cent. In hospital the cases are usually admitted because they suffer from complications, and as a result the case death-rate is very high—from 11 per cent. to 18 per cent., or, roughly, double that of hospital-treated diphtheria. As in measles, it is the very young who suffer most, and infants of under six months are distinctly more liable to develop whooping-cough than measles.

The extent of this massacre of the innocents by these two diseases is well exemplified by the following figures.

Total deaths (in four consecutive years):

|                   | Deaths under 5 years | Deaths under 2 years |
|-------------------|----------------------|----------------------|
| Whooping-cough     | 512                  | 499                  | 386                  |
| Measles           | 372                  | 353                  | 265                  |
**Sequeæ.**

Diphtheria is not a disease which is troublesome or dangerous through its sequeæ. The paralysis is very short-lived, and intercurrent complications of importance are rare. If care is taken to avoid undue exertion the heart is unlikely to give trouble after discharge from hospital, and soon regains its tone. Scarlet fever very occasionally leaves kidney disease behind it, but in my experience this is rare. Valvular cardiac disease also may start during an attack, but this has been estimated at so low a figure as 3 per 1000 cases, and probably this is not much understated. I propose to leave the question of otorrhœa to the otologists. It is a common complication, but, if the ears are kept clean, does not leave much deafness at the time of the attack, nor is obvious mastoid disease at all common in hospital. It will be interesting to hear of the more remote results. I should be inclined to think measles is responsible for more damage. It is interesting to note that a recent investigation of the relation of scarlet fever to life insurance resulted in the conclusion that the disease made little or no difference to the prospects of insured persons.

When, however, we come to measles and whooping-cough the sequeæ are more important. Measles has been described as an essentially "tuberculising" disease, and many of the broncho-pneumonic conditions which follow it become tuberculous. Emphysema and chronic bronchitis are not uncommon. Otorrhœa is, as I have suggested above, probably even more serious than in scarlet fever. Eye troubles leaving opacities of the cornea and so forth are not infrequent. It has been alleged that measles predisposes to certain nervous diseases. This is against my experience, and I am inclined to believe that too much stress may be laid on the fact that a child has had measles. After all, few children in big cities have not had measles.

Whooping-cough leaves behind it bronchitis, emphysema, tuberculosis, dilated and strained hearts, and hernia. The great prevalence of these two diseases increases the importance of these after-effects.

**Prophylaxis.**

It is difficult to see what more can be done as regards scarlet fever and diphtheria. There is no tendency to underrate their importance, and they are dealt with as thoroughly as our knowledge of their epidemiology permits. We would undoubtedly be considerably aided if research could determine the etiology of scarlet
fever, and, when its unknown cause can be put under the microscope as is that of diphtheria, the control of the disease will be a more simple matter. Diphtheria is undoubtedly spread in schools by the common use of towels, pencils, and so forth, but as long as carriers of the bacillus are as common as they are it is perhaps unfair to blame the schools too much. It is by no means certain, moreover, that schools play much part in the dissemination of scarlet fever.

The real crux of the question is the prevention, or, failing that, the management, of measles and whooping-cough. An American writer has justly observed that a child dead of whooping-cough is just as dead as a child dead of plague, and that if 10,000 persons died annually in the States of bubonic plague, as they do of whooping-cough, the world would put America in quarantine. We might say the same of measles. The figures I have already given show that these two diseases are really more destructive than those illnesses of which the general public is frightened. But prevention is almost impossible. In both diseases infection is usually spread before definite symptoms are recognisable, and the most we can do is to limit infection as much as possible. The aggregation of very young children in schools and nurseries seems a mistake, but the common stair affords almost equal possibilities of infection. That the illness is often brought back from school and given to the infants at home is very probable, but the closing of schools is not always successful in limiting outbreaks. Much can be done by the education of parents and of teachers, and the former should be warned of the importance of colds in the head when measles is prevalent. Health visitors should do all they can to spread knowledge of the danger of these diseases and of the necessity of getting the children to bed in the early stages of illness. Probably nearly all the chest disease which is responsible for the death-rate in both instances is contracted during the early unrecognisable stage, and if children exposed to measles were kept strictly to bed from the first cough or sneeze the mortality would be much reduced. As it is, the children in this stage are often turned out to play on damp stairs and wet streets.

It is to be hoped that research as regards these two diseases will be encouraged. The bacillus of whooping-cough may be accepted as the cause of the illness, and vaccine treatment is already employed. The results are disappointing at present, but may improve. Preventive vaccination, however, for infants might be worth considering, and should be tested on a large scale. But
as regards measles we are quite in the dark, and much research is needed. Here, too, vaccination may have a future. The obvious thing to do is to postpone the age at which these diseases are taken if they cannot be prevented altogether. If that could be effected the mortality would be hardly worth considering.

Edinburgh is one of the few cities which has for years provided a certain amount of isolation accommodation for measles and whooping-cough and has dealt with large numbers of children from the poorest parts of the city. The death-rate is usually high, but the satisfactory thing is that many children are saved who would certainly have died at home. Isolation is of no use whatever in preventing the spread of these infections. That has already occurred before the nature of the illness is recognised, and in the case of whooping-cough it is at least probable that by the time the average patient reaches hospital he has ceased to be infectious. But hospital treatment has saved, and will save, many lives, and the scheme brought forward by the Medical Officer of Health includes the provision of more beds for whooping-cough. The free ventilation of good wards and the possibility of actual open-air treatment not only helps the pulmonary cases in their acute stage but also reduces the nervous irritability of whooping children. And, perhaps most important of all, it lessens the probability of subsequent tuberculosis. But it is no use crowding the patients into insufficient ward space. In both diseases ample floor space per bed is required, and the difficulty is to provide sufficient accommodation in the rush of an explosive epidemic. It is a matter of opinion, but I would give these dangerous diseases preference over scarlet fever, leaving cases of the latter disease at home in the better-class districts. The reduction of the detention of scarlet fever to, say, four weeks instead of six would also increase the available space.