1887.

VICTORIA.

TYPHOID FEVER.

REPORT BY THE CENTRAL BOARD OF HEALTH.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND.

By Authority:
ROBT. S. BRAIN, GOVERNMENT PRINTER, MELBOURNE.

No. 97.
### APPROXIMATE COST OF REPORT.

<table>
<thead>
<tr>
<th>Description</th>
<th>£</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation—Not given</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printing (1010 copies)</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£20 0 0</strong></td>
<td></td>
</tr>
</tbody>
</table>
Public Health Department,  
Offices of the Central Board, 16th September, 1887. 

To the Honourable the Chief Secretary, &c., &c., &c.  

Sir,  

We, the Members of the Central Board of Health for the Colony of Victoria, have the honour to submit this our Special Report on the subject of Typhoid Fever.  

The late epidemic in Victoria commenced earlier than usual, and the disease was generally regarded as more than ordinarily prevalent and fatal. Although typhoid fever is never entirely absent from the colony, it is well known that it chiefly prevails towards the end of summer, and especially in autumn. This holds true not only in Australia, but also in England and America. Hence, “autumnal or fall fever” is one of the many names by which it is designated.  

By referring to the table appended to this Report, the death-rate in the different months for the last nine years may be readily ascertained. By comparing the early months of last summer with the corresponding months of former years, an approximate estimate may be formed of the comparatively early appearance of the recent epidemic.  

It is to be observed, however, that the table gives the returns only for Melbourne and its suburbs,* as the monthly returns for the whole colony were not obtainable. We may here also explain that, as the notification of infectious diseases other than “malignant” is not compulsory in Victoria, the actual number of cases of typhoid cannot be accurately ascertained. Hence, only the death-rate is shown in the table referred to. This defect in regard to the notification of infectious diseases is specially provided for in the Amending Public Health Bill now before Parliament, and the necessity for such a measure is so obvious that it requires no special advocacy here.  

In reference to the death-rate in typhoid fever, which, according to Dr. Broadbent, of the London Fever Hospital, varies from 15 to 25 per cent., it must be borne in mind that the mortality does not always stand in anything like an exact or uniform relation to the real number of cases of the disease which may have occurred in any given season. It is well known that the mortality in one epidemic is more severe than in another. It must also be remembered that, at present, it is impossible to state the death-rate in Victoria.  

That season has considerable influence upon the prevalence of typhoid fever cannot be doubted. There is abundant evidence that the disease prevails more extensively after a long drought, when the air is warm and dry, than after a cool season. It is not merely the high temperature of the air in summer, but also the raised temperature of the water and of the soil, as well as the want of rain, causing drought and stagnation of liquid filth, that promote the prevalence of the disease. A large amount of ozone in the atmosphere has, probably, a good effect in checking its spread. But peculiarities of season may not only affect the severity of the epidemic, but also the time of appearance. For although the Government Astronomer is not aware of any peculiar meteorological conditions which can explain the unusually early occurrence of the disease last summer, he observed that the season was early also for vegetation, birds, &c.  

Upon referring to the table, Appendix A, it will be seen that typhoid fever assumed a severe form earlier last summer than usual, judging from the death returns in Melbourne and suburbs. In the nine preceding years (1878-86), the highest average mortality occurred in March, whereas last season the climax was reached in February.  

* Embracing a radius of ten miles, and including five other cities, five towns, and seven boroughs.
The following brief abstract shows this at a glance:

<table>
<thead>
<tr>
<th>Months</th>
<th>Number of deaths each month from December, 1886, to June, 1887</th>
<th>Average number of deaths in corresponding months for last nine years, 1878 to 1886</th>
<th>Meteorological States from the 1st December, 1886, to 30th June, 1887</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean Temperature</td>
<td>Mean Atmospheric Pressure</td>
</tr>
<tr>
<td>December, 1886</td>
<td>...</td>
<td>12:6</td>
<td>63:4</td>
</tr>
<tr>
<td>January, 1887</td>
<td>...</td>
<td>17:4</td>
<td>69:1</td>
</tr>
<tr>
<td>February, 1887</td>
<td>...</td>
<td>25:7</td>
<td>67:9</td>
</tr>
<tr>
<td>March, 1887</td>
<td>...</td>
<td>34:2</td>
<td>65:0</td>
</tr>
<tr>
<td>April, 1887</td>
<td>...</td>
<td>32:8</td>
<td>59:5</td>
</tr>
<tr>
<td>May, 1887</td>
<td>...</td>
<td>31:3</td>
<td>52:5</td>
</tr>
<tr>
<td>June, 1887</td>
<td>...</td>
<td>19:1</td>
<td>49:3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>307</td>
<td>173:3</td>
</tr>
</tbody>
</table>

The following table shows the number of deaths, and their proportion to the population, during each of the last nine years:

**Population and Deaths from Typhoid Fever in Victoria, 1878 to 1886.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Number</th>
<th>Number per 10,000 of the Population</th>
<th>Estimated Mean Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1878</td>
<td>532</td>
<td>6:48</td>
<td>821,466</td>
</tr>
<tr>
<td>1879</td>
<td>438</td>
<td>5:25</td>
<td>834,030</td>
</tr>
<tr>
<td>1880</td>
<td>297</td>
<td>3:49</td>
<td>850,343</td>
</tr>
<tr>
<td>1881</td>
<td>331</td>
<td>4:04</td>
<td>868,942</td>
</tr>
<tr>
<td>1882</td>
<td>472</td>
<td>5:30</td>
<td>890,220</td>
</tr>
<tr>
<td>1883</td>
<td>661</td>
<td>7:26</td>
<td>910,982</td>
</tr>
<tr>
<td>1884</td>
<td>456</td>
<td>4:88</td>
<td>933,894</td>
</tr>
<tr>
<td>1885</td>
<td>424</td>
<td>4:12</td>
<td>958,395</td>
</tr>
<tr>
<td>1886</td>
<td>523</td>
<td>5:30</td>
<td>987,094</td>
</tr>
</tbody>
</table>

But, after all, it should be clearly understood that seasonal influence is merely an exciting, and not the real originating, cause of typhoid fever. It only co-operates with certain other auxiliary conditions which are favourable to the spread of the disease, but none, nor all, of these can in any true sense originate it. Hence, although season is a matter of influence in connexion with the prevalence of typhoid epidemics, it is not the true cause. Perhaps no subject has been more keenly discussed in recent times than this question respecting the causation of typhoid fever. The discussion has not been a mere fruitless war of words, confined to abstract and impracticable theories. When criticism is carried on in an honourable spirit, it becomes highly useful in detecting what have been called, somewhat paradoxically, the "false facts" in medicine. The arguments and investigations so ably conducted by some of the best minds in the medical profession have been productive of sanitary results of the most practical kind. This is seen in the change, both in theory and practice, that has taken place since Dr. Budd, (not to mention others) wrote his famous treatise in 1873. It is also noticeable, in a very matter-of-fact way, in the sanitary improvements and lessened mortality that have taken place in late in the cities and large towns in England and elsewhere. Even our own colony, although far behind in this respect, has profited to some extent by the change of opinion and sanitary progress which have been doing so much good in other parts of the civilized world. A spirit of inquiry has been awakened both in and outside the ranks of the profession. It is now felt that the relation between dirt and disease is a public as well as a professional question. Increased knowledge, especially in reference to hygienic matters, combined perhaps with a better appreciation of the relation in which individuals or families stand to the common good, has stirred the broader sympathies and quickened the mental and moral activities of at least a certain portion of the community, so that a larger and more intelligent interest is now taken in the various circumstances that affect public health than obtained in former times. While this is the case in a general way, it is also true of the particular subject of this report. For although much remains to be done in the
way of getting scientific views accepted regarding the origin of typhoid fever, and put
into practice so as to prevent its spread, still it is certain that decided progress has
been made of late, and hopeful results may be expected.

This is observed by comparing the opinions now held by many medical men
in Victoria with those entertained by the profession here some years ago. When
the late Dr. Thomson, of South Yarra, published his valuable work on "Typhoid
Fever," in 1874, he tells us that he wrote to all the medical men of the city and
suburbs, in order to ascertain their opinion with regard to typhoid. One of the
questions put was—"Were there any proofs of contagion?" and he informs us that
from all the answers received "only one replied emphatically, 'Yes, most distinct.'"
Dr. Thomson then remarks—"The current opinions, as deducible from the answers,
"are that typhoid is not contagious, and these agree with the general belief of the vast
"majority of the profession in Great Britain." We venture to affirm that a different
belief is now held by the more intelligent members of the profession, both in Victoria
and Great Britain. The view which maintains that the disease can arise only from
contagion has been gaining ground, and the balance of opinion is now decidedly in
favour of that mode of origin. It thus appears that the views advanced by some of
the best authorities many years ago still hold good, and have been corroborated by
later investigation and experience. Trousseau stated the case thus, about half a cen-
tury ago, in his well-known work on "Clinical Medicine"—"The number of the
"disbelievers in contagion is daily diminishing. The contagious character of typhoid
"fever is among the ascertained facts of science. So far back as 1829, the fact was
"announced by Bretonneau, and by Leuret; it was repeatedly confirmed by Lombard,
"Mayer, and many others."

Professor Stokes, of Dublin, expressed himself in the following manner in
1874:—"The opinion was almost universally held that this form of fever was non-
"contagious, but the adherents to this doctrine are becoming less numerous of recent
"years. I have long believed in the contagion of the typhoid fever of this country.
"In the epidemic of 1826-27 we had abundant proofs of contagion."

Dr. Budd, whose name is so honorably identified with this subject, puts the
matter briefly in these significant words—"Contagion is the master-fact of its history."

It is well known to those who have paid attention to this question of the origin
of typhoid fever that drinking water may not only be very impure, but even polluted
with ordinary faecal discharges, and yet the inhabitants remain free from the disease
until a person infected with typhoid comes to the place, and then an outbreak soon
afterwards occurs. In such circumstances, it is impossible to avoid the conclusion
that the imported typhoid poison was the source of contagion. If such an inference
were not allowed, then it would have to be admitted that although all the ordinary
and known conditions were present long before the infecting germs were introduced,
yet no development took place until the typhoid case appeared upon the scene, and
then, by a strange coincidence, the disease broke out spontaneously. Too many
instances of the kind, however, have occurred for the human mind to regard them
as anything else than cause and effect. The following convincing proof is given by
Professor Parke's, in his Manual of Practical Hygiene*:—"Very polluted water
"had been used for years by the inhabitants of Nunney without causing fever, when
"a person with enteric fever came from a distance to the village, and the excreta
"from this person were washed into the stream supplying the village. Between
"June and October, 1872, no less than 76 cases occurred out of a population of 832
"persons. All those attacked drank the stream water habitually or occasionally. All
"who used filtered rain or well water escaped, except one family who used the water
"of a well only four or five yards from the brook. The case seems quite clear—first,
"that the water caused the disease; and, secondly, that though polluted with excrement
"for years, no enteric fever appeared until an imported case introduced the virus.
"Positive evidence of this kind seems conclusive, and I think we may now safely believe
"that the presence of typhoid evacuations in the water is necessary. Common fecal
"matter may produce diarrhoea, which may perhaps be febrile, but for the production
"of enteric fever the specific agent must be present. The opinion that the stools of
"typhoid are the especial carriers of the poison was first, I believe, explicitly stated by
"Canstatt, and has also been ably stated by W. Budd."

As an instance of the importation of typhoid fever into a previously healthy village, we may mention what took place at Lilydale in the present year. A groom from Melbourne felt ill, and went to Lilydale to improve his health. His wife accompanied him, and she also fell ill while there. Both cases turned out to be typhoid. While in Lilydale they lived at a boarding-house and grocery store for about two weeks. About a fortnight after their removal two cases occurred in the house in which they had resided, and then a third followed. There were also about sixteen cases in the same street in which the boarding-house stood. There were no cases of typhoid in the township before the groom and his wife went there. The health officer was decidedly of opinion that the origin of the outbreak was traceable to its importation from Melbourne. See the report in full, in the Report of the Central Board of Health for 1887.

Such instances as these prove that one case of typhoid fever arises from another. This is exactly what occurs in small-pox, but no one ever thinks of assigning any other cause than contagion in that disease. Nor is it scientific to assume that the specific poison of typhoid fever originates in two entirely different ways. Nothing of the kind is known to scientists in the animal or vegetable kingdoms, nor to medical men in the case of such diseases as measles, small-pox, or scarlet fever. As Dr. Thomson, already quoted, observes:—"If, therefore, typhoid fever observes the conditions of true zymotic fevers in all other particulars, it may likewise be inferred to obey the ordinary laws of contagion. To assert, as some do, in a compartmented spirit, that typhoid fever is only contagious in a limited degree is ambiguous, unscientific in theory, and perilous in practice."

The disease sometimes occurs in isolated places where there is no known history of a previous case; and this, no doubt, tends to countenance the idea of its spontaneous origin. But it is well known that the poison may remain dormant for a long time, and still be capable of propagating the disease when favourable conditions arise. A case is mentioned in the Sanitary Record for February, 1886, where there was very conclusive evidence that the typhoid poison had lain dormant for ten years in a choked-up drain, and then caused the fever when the drain was opened and the germs liberated. It is impossible to say how long such germs may retain their vitality.

Then, again, it sometimes happens that persons are attacked who live in healthy localities where the drains and surroundings are in a sound sanitary state. But it is forgotten that such persons may have been infected in a place far removed from their own dwellings. The typhoid poison may also be imported into a locality by a person whom no one suspects of suffering from the disease—even the person who carries it may not be aware of the circumstance himself. Closets at hotels, boarding-houses, and railway stations are, probably, often infected in this way. Mild cases of typhoid are easily mistaken for diarrhoea, and such cases are probably as effectual in propagating the disease as the more severe forms.

It is not intended, in a report of this kind, to give all the arguments for or against any particular view of the origin of this disease; but, before leaving the point now under consideration, we may observe that those who hold that typhoid is contagious, and only propagated in that way, do not thereby assert that the mode of transmission is necessarily by direct contact, as in the case of ringworm or itch. What is meant is that the disease or fever-poison is communicable from the sick to the healthy, although perhaps not in the same direct way from person to person as takes place in scarlet fever or small-pox. The contagion in typhoid fever probably acts through the excreta indirectly, rather than by direct emanations from the patient himself, or from the fresh evacuations. The result, however, is practically the same, whether by direct or indirect contagion, although the mode of transmission may be different.

We shall now briefly consider the extent to which the disease prevails in the colony. Owing to the want of provision for the compulsory notification of contagious disease in Victoria, there are no data by which we can ascertain the exact number of typhoid cases which occur during any epidemic. We know, however, that the mortality from typhoid fever alone throughout the colony last year, amounted to 522 cases. That is not only a high, but a culpably excessive death-rate from a preventable disease, when we remember that the whole population of the colony is
very little over 1,000,000.* The mortality of the present year cannot yet be compared
with that of the past, but taking the death-rate of the first half—viz., January to
June inclusive—we find that 281 deaths occurred from typhoid in Melbourne and its
suburbs.

These figures confirm the impression entertained that the late typhoid season
was more than ordinarily severe. Allowing that it was so, it must still be admitted
that the great prevalence of the disease in the colony for so many years, as well as the
discreditably high death-rate, reflects severely upon those who have been responsible
for such an inveterate and serious state of matters. Apart from the exceptionally
severe epidemic of last season, the average mortality from typhoid fever in Victoria
for a number of years has been about 470 deaths per annum. And the death-rate has,
for the last two seasons, been increasing out of proportion to the growth of population.
In this respect, Victoria contrasts unfavourably with England. The Health Officer
for the City of Melbourne, in an address on "Typhoid Fever," delivered at the annual
meeting of the Medical Society of Victoria in January, 1887, refers to this point in the
following terms:—"In England, the deaths from fever, mainly consisting of those from
"typhoid, numbered 17,910 in 1870; they had fallen to 7,918 in 1883, in spite of a
"considerable increase of population. In Victoria, the annual average mortality of
"the five years, 1871 to 1875, was 360, while in the years 1881-85 the average was
"473, the population not having increased in equal proportion."

Then contrasting Melbourne and suburbs with the chief towns of England, Dr.
Jamieson shows that while, in 1879, the mortality from fever in 20 of the principal
towns, including London, was at the rate of 2·9 per 10,000 of the population, the rate
of mortality in Melbourne and suburbs on the average for the ten years, 1876-85, was
7·3 per 10,000. But passing from comparison with any other country in the mean­
time, we find that 470 deaths represent a much larger number of persons who pass
through a tedious, offensive, and debilitating disease, suffering loss in different ways
—in some cases the patient's health being permanently impaired.

It is calculated that from 15 to 25 deaths occur, on an average, in every 100
cases of illness from this disease. As there is no reason to believe that the proportion
of deaths to cases is greater in Victoria than in England, we may take the lowest
estimate, viz., 15 per cent. We then find that, on an average, 3,153 persons suffer
from typhoid fever in Victoria every year, and out of that number 470 of the cases
terminate fatally. This disease has often been called, and very appropriately,
"Colonial fever."

But it may be asked how is it that a disease, "altogether and easily preventable,"
as Dr. Parkes puts it, should be allowed to go on killing hundreds and disabling
thousands one year after another, not only without intermission but occasionally with
increasing severity? The question is one which may well receive the earnest attention
of local boards throughout the colony.

When a railway accident occurs through carelessness or stupidity, the heart of the
community is shocked at the terrible calamity, and energetic measures are taken
at once to ascertain the cause, and prevent the occurrence of a similar disaster. But,
although there is no comparison between the loss of life by a railway accident and
that from typhoid fever in this colony, and, further, although the one occurs only
occasionally while the other has been in operation for years, yet, notwithstanding
these points of difference, the greater evil, which works silently and unseen, is allowed
to go on with increasing prevalence, while the less but more sudden and startling
calamity is taken in hand at once. Both evils are preventable, at least to a large
extent, and both concern human life. How is it, then, that so much is done to prevent
the one, and so little to stamp out the other? May the difference not be accounted
for in great measure by the fact that, in a railway, mining, or marine accident, every
effort is made to ascertain the true cause—whereas, in typhoid fever, wrong views as to
its causation tend either to inaction, or to misdirected and imperfect effort in tracing its
source and preventing its spread? Sir Thomas Watson, whose opinion is entitled to
consideration, justly remarks that—"If this fever be really contagious, it is not only
"erroneous but dangerous to hold the contrary opinion." It is, therefore, quite reason­
able to conclude that the great prevalence of typhoid fever in Victoria is, to a large
extent, the natural result of erroneous and dangerous opinions.

* Estimated at 1,005,043 on 31st December last.
Having thus far looked at the originating cause, and the prevalence of the disease, we shall now point out some of the insanitary conditions which may account for the present unsatisfactory state of the colony in this matter.

1. **Bad or Imperfect Drainage.**—One of the darkest insanitary blots in Victoria is the want of a properly-designed system of drainage efficiently carried out. This applies to the larger cities and towns as well as to the country districts. As cities and towns enlarge, land is sold and houses are erected without due regard to proper drainage and levels. The result is that the ground in many places gets charged with typhoid excreta, as well as with other filth. A nidus is thus formed for the poison germs. For although the decomposition of fecal and other putrid matter does not originate this disease, it is certain that it may act as an agent in spreading it.

It is on this infected material, stored up in the soil and cesspits, or lurking in badly-constructed drains, with semi-stagnant sewage, that the dry summer weather operates, and produces the autumnal epidemics. The fever-poison finds various channels through which it gains ready entrance into the human system, such as water, milk, and air.

The present defective state of street gutters has been several times referred to in recent reports on the insanitary condition of various places in the colony, and the latest of these reports may be seen in Appendix C of the Central Board of Health's General Report for 1887. The points chiefly insisted on are that the drains should be compactly constructed, with a smooth impermeable surface, so as to prevent soakage into the subsoil. It is almost unnecessary to add that in many of the boroughs and townships there is a great want of paved channels of any kind.

With regard to sewers or underground drains, adequate means for access, ventilation, and cleansing are absolutely necessary; and in England it is mandatory on local authorities to provide such means. It has repeatedly been proved by analysis that various gases, such as nitrogen, carbonic acid, carburetted hydrogen, and sulphuretted hydrogen, &c., have been found in unventilated sewers; whilst in sewers properly ventilated, and to which atmospheric air has been freely admitted, no carburetted or sulphuretted hydrogen has been detected, and carbonic acid in only very small quantities. (See Dr. Russell's Experiments, London, 1870.) When a sewer is filled with sewage and gas, some of the latter is expelled every time additional sewage enters, but when an outflow of sewage takes place, a partial vacuum is formed, and air passes into the sewer. Notwithstanding sanitary progress, many people still believe in the efficacy of trapping without ventilation. They think that sewer gas cannot force itself through an inch or so of water. That sewage gases do pass through traps has actually been demonstrated by experiment. A glass trap was used for the purpose, and the gas was seen to pass through the water. The same has also been proved in a sanitary way by many well-authenticated instances of towns where typhoid had been unusually prevalent, having been practically free from the disease after the sewers and drains had been ventilated and air-disconnected.

It is well, therefore, to understand that the normal condition of a sewer varies greatly. In dry weather, it is all but empty during night, while at noon it is nearly full. Then it is subject to variations of temperature, owing to the entrance of hot water and storm water at different times. Hence, the air inside a sewer is alternately dilated and compressed, and as the result of this expansion and compression sewer gas, in the absence of other means of exit, will make its way through any ordinary trap.

This question respecting the proper ventilation and air-disconnection of sewers, drains, and pipes, is a matter of great importance in connection with the sanitary condition of dwelling-houses, hospitals, and other institutions, either public or private. It will be referred to again when speaking of the construction of dwelling-houses.

As to the comparative merits of covered and uncovered drains, something may be said for and against both. A drain exposed to the air throughout its course, however dirty, is not so dangerous as a closed, unventilated sewer; but it must be admitted that the open-drain system is a very unsightly method of conveying liquid filth through the streets of a town. The strongest objection, however, against surface drains is, that in most towns they are to be found in many of the streets with insufficient fall. The local board's engineer, however skilled, may be unable to
remedy the defect, as the inclination of the drain depends upon the grade of the street, whilst in any underground system the sewer may be laid to such a fall as to make it self-cleansing.

Many of the objections urged against sewers are founded not upon anything inherently bad in the principle, if properly carried out, but rather upon errors of construction and want of proper attention to necessary details.

The presence of lagoons and malarial swamps in the neighbourhood of towns is clearly a sanitary question that should not be overlooked. These should at least be drained where they cannot be filled up.

The drying of wet subsoil by under drainage is hardly of less importance to the health of a city than proper sewerage, and cannot be safely neglected. The completion of such work is almost invariably followed by a marked reduction in the number of cases of such diseases as typhoid and phthisis.

The value of sanitary measures in lowering the death-rate of typhoid fever is well shown in the following return:

In England the deaths were—

<table>
<thead>
<tr>
<th>Period</th>
<th>Deaths per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 1861 to 1870</td>
<td>19,000</td>
</tr>
<tr>
<td>From 1871 to 1880</td>
<td>7,000</td>
</tr>
</tbody>
</table>

At Frankfort on-the-Main the deaths per 10,000 of the population were—

<table>
<thead>
<tr>
<th>Period</th>
<th>Deaths per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 1854 to 1859</td>
<td>8</td>
</tr>
<tr>
<td>From 1875 to 1880</td>
<td>2.4</td>
</tr>
</tbody>
</table>

At Dantzic the deaths per 10,000 of the population were—

<table>
<thead>
<tr>
<th>Period</th>
<th>Deaths per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 1865 to 1869</td>
<td>10.8</td>
</tr>
<tr>
<td>From 1871 to 1873</td>
<td>9</td>
</tr>
<tr>
<td>From 1876 to 1880</td>
<td>1.8</td>
</tr>
</tbody>
</table>

II. Improper Disposal of Nightsoil. — Although the pan system is an undoubted improvement upon the old cesspit, it has great disadvantages unless properly carried out. Deodorants—earth, ashes, sawdust, &c.—are absolutely necessary. In Lancashire and elsewhere in England the system has been brought to a high state of perfection. Neglected, the pan system is "filth-detaining." The excreta is kept (if without deodorants) in a decomposing or fermenting state generally for a whole week, and in some places, where there is no regular municipal service, longer.

Pan-closets are usually placed in small back yards, close to the dwelling-house. The pans, after being emptied, are too often not cleansed—are sometimes exchanged in a dirty state, and are frequently improperly replaced or adjusted. The vacancy under the seat is, as a rule, too large, and is often left dirty. With an accumulation of putrefying fecal matter in the pans and a surface exposed (if without deodorants) which, taken in the aggregate, may be computed in cities by acres rather than feet, it seems almost impossible that the air around the dwellings can escape contamination.

Where a thoroughly efficient deodorant cannot be conveniently obtained, ashes from the hearth should be kept, and some put into the pan each time the closet is used. It is a common occurrence that persons suffering from mild attacks of typhoid fever, and not confined to bed, use the family closet. Proper instructions may not always be given to attendants upon the sick, and the typhoid discharges, instead of being disinfected and buried or otherwise destroyed, are thrown disinfected into the closet-pan. Conditions such as these are doubtless favourable to the spread of the disease. To remove the pans as frequently as they ought to be, and at each removal to replace the dirty pan with one thoroughly cleansed and disinfected, should not be regarded by local boards as impracticable on account of the expense, as the system is well carried out in one or more of the suburban municipalities.

It is useless, however, to expect that true disinfection will be constantly carried out in an efficient manner; and it is well known that most of the popular disinfectants, so-called, have no effect whatever on typhoid germs. Probably the best disinfectant known is corrosive sublimate, but it is a dangerous poison, and not safe for general use in families. There is great difficulty in getting people to use disinfectants constantly, both on account of the trouble and expense.
From what has already been stated it will be seen that the pan system, although greatly superior to cesspools, is usually far from perfect in a sanitary point of view. With all its drawbacks, however, it is doubtful whether a better substitute can be found in those parts of Victoria where the water supply is precarious. It may be true, as stated by Dr. Parkes, that removal of excreta by water "is the cleanest, the readiest, the quickest, and, in many cases, the most inexpensive method"; but it is obvious that such a method is practically inapplicable to many parts of this colony at present. And, indeed, the same high authority now quoted candidly states that it is impossible for all places to have the same plan, and that "the circumstances of each town and village must be considered in determining the best method for the removal of excreta."

The most effectual plan is destruction by fire. It would be of great service in all cities and towns where there are hospitals to which typhoid cases are frequently sent from the country. The erection of a furnace, or "Destructor," would be money well laid out, and true economy in the end. Such an apparatus would serve for the destruction of refuse of all kinds.* In small townships, were these furnaces could not be established, on account of the expense, a suitable piece of land should be set apart as a burying ground, in which the typhoid excreta, after being disinfected with corrosive sublimate, should be properly trenched in. When a typhoid outbreak occurs, the local board should organize a special service for collecting and destroying the infected excreta daily. The importance of promptly dealing with typhoid evacuations, as soon as passed, receives additional force from the fact that there is some reason to believe that typhoid stools are comparatively harmless when they leave the patient, and that it is only after some hours they become virulent. It is true that this view has not yet been conclusively proved, but there is considerable evidence to support it. Dr. Cayley, who has specially called attention to this aspect of the subject, remarks:—"The experience of the London Fever Hospital pretty conclusively proves that the fresh stools are innocuous. If these views are correct, it becomes an important subject of inquiry as to how soon the stools acquire contagious properties. I am not aware of any observations which would enable us to decide this point with certainty, but the time is probably a very short one. The frequency with which washerwomen have been infected by soiled linen points to a very short duration, as such linen is seldom retained for any length of time. Some facts which have come under my own observation, though not conclusive, are also in favour of the period being very short." Dr. Cayley thinks it probable that the contagious properties in the stools become developed in about twelve hours. He adds:—"The practical conclusion to be drawn is, I think, this—that we have in all cases a few hours during which it lies in our power to render the poison innocuous, and so prevent the spread of the disease by direct infection." (See "Croonian Lectures on Typhoid Fever for 1880.") If this theory is correct, it may explain why nurses frequently escape infection, while washerwomen have often contracted the disease after washing the clothes and bedding of typhoid patients, probably from inhaling poison-germs floating in the air, and derived from the dried discharges on the sheets, &c.

It is well known that soiled linen is a dangerous source of contagion, and that such material may retain the poison for a long time. This shows the necessity for promptly removing all bed and body clothing as soon as soiled, and immediately boiling in water, to destroy infection. Mr. Le Capelain is of opinion that the disease is often spread by washerwomen not subjecting soiled clothing to sufficient boiling, and afterwards allowing the water, laden with undestroyed germs, to pass into the street gutters. When such clothing cannot be put into boiling water immediately, it should be placed in water with some chloride of lime or chloride of zinc.

The suggestions now made relative to the use of furnaces; the proper disinfection and burial of typhoid excreta, where destructors cannot be obtained; the organization of a special service during outbreaks of the disease, for the daily removal of the discharges while still fresh and innocuous; all these are of vital importance, and ought to be taken in hand without delay. Money considerations should not stand in the way, seeing that the colony is now in a perilously insanitary condition, and that

* See Central Board's General Report of 1st June, 1887, pp. 8, 9, and 23, and previous Reports.
the object of these practical measures is the saving of about 500 human lives every year. The end would justify the means, and present circumstances urgently demand it.

Further, all cesspits should be abolished (as required by the Health Amending Bill now before Parliament), and a regular night service established in places where such convenience is not in operation. Suitable depôts ought to be selected where ordinary nightsoil can be properly trenched in.

The daily removal of domestic refuse—animal and vegetable—is also of much importance in preventing the spread of infectious disease.

Before passing to the next branch of our Report it is desirable to point out that corrosive sublimate, being a deadly poison, should only be used under the direction of a health officer or other competent person. When corrosive sublimate or an equally effective disinfectant is not available, freshly burned lime may be used with great advantage.

III. Contaminated Water Supply.—Melbourne and the suburbs are fortunate in having a good water supply. It is otherwise with many of the towns in the colony, where the water is not only scarce but impure. The pollution of many of the rivers and creeks, in consequence of foul drainage, is becoming a very serious matter, especially as the contaminated stream is sometimes either the chief, or occasional, source of water supply for a township. In a recent report on an outbreak of typhoid fever at Lilydale, published in the Central Board’s General Report for 1887, it was shown that the Olinda Creek, naturally a clear stream, was contaminated by the greater part of the drainage from the township running into it. The creek was unfenced, and ducks, geese, dogs, and other animals had access to it. A typhoid patient was found in a house about 25 yards from the creek. A railway camp at Ballast Pit, near Lilydale, with 120 men and 20 women and children, were supplied with water from this creek. The drinking water was used without being boiled.

In February, 1887, Mr. Butler, instructed by the Central Board of Health, visited and reported upon the insanitary condition of a camp on the Narracan Creek, in Gippsland, where 800 men (besides 200 women and children), were employed in the construction of the Narracan Valley Railway. With the exception of a few places of convenience which the overseers and storekeepers had constructed for themselves, there was neither closet nor urinal for these 1,000 people. In the neighbourhood of the camp, the banks of the stream were thickly studded with excrement, quite down to the water’s edge, and the air was tainted with the foul smell. The creek was the sole water supply for the whole camp, and also for twenty families at Moe, a number of selectors, and one or two townships lower down the creek.

A similar state of things was found at the railway construction camps on the River Yarra, Yarra Flats, also at Healesville, on the banks of the Watts River, and at the waterworks camp near Yarra Flats. (See special reports on these places, in the Central Board’s General Report for 1887.) At Avoca, the water supply was found closely connected with the drainage. Two wells near the Avoca River supplied the township, when roof water failed. The drainage of the township is into the Avoca, across which a weir had been constructed. The wells had been sunk above the weir, one about 20, and the other about 40 or 50 feet from the river. There can be little doubt the wells are supplied by percolation from the river. Hence, in the summer time, when there is a scarcity of rain water, the people unsuspectingly drink diluted sewage. It will be no mystery then if, next season, there is a still greater outbreak of typhoid than has occurred this year, seeing that the drainage of houses, now infected with typhoid, finds an outlet into the Avoca, which feeds the wells. (See special report in the Central Board of Health’s General Report for 1887.)

To prevent the pollution of rivers and creeks by foul drainage, a system of intercepting sewers should be laid down, and the sewage dealt with by land irrigation, or other well known processes. Such works rarely present any great difficulty to sanitary engineers, the real difficulty being that of finance. The well-known sewage farms at Edinburgh and Croydon, and more recently that at Adelaide, show how the fecal matter from centres of population can, when local surroundings are favourable, be treated both safely and profitably. There can be no doubt that the Metropolitan Board of Works—when it comes into existence—will do well to give this branch of the question serious consideration. In England no extensive drainage scheme can be
undertaken until the plans have been approved by the Local Government Board. One reason is obvious, as the plan that benefits one township or district may result in being injurious to another. The principle is no less applicable to Victoria.

Water obtained from wells, or stored in underground tanks, is liable to become polluted by the infiltration of impure drainage, or from surface washings during heavy rains or floods.

In a recent report on Donald, it is shown that both cesspits and underground tanks are quite common in the township, and that the latter are liable to be contaminated by the former through percolation. Although some of the cesspits are never cleaned out, their contents, nevertheless, keep much about the same level, owing to the liquid part sotaking into the porous ground. Cesspits ought to be abolished, and underground tanks and wells should be carefully constructed by skilled labour and good material, such as puddle in sufficient thickness, cement, &c. They should also be periodically emptied, examined, and thoroughly cleansed; and the heads of all down rain-water pipes ought to be protected, so as to prevent birds, mice, &c., being washed down into the tank.

Water which is not covered may be polluted by dust (containing disease germs) being blown into it. Most waters require filtering, and all without exception should be boiled when there is danger of typhoid infection.

IV. Contaminated Milk Supply.—An extensive outbreak of typhoid fever occurred at the Geelong Grammar School in May of the present year, and was traced by Dr. Shields to infected milk. For details, which are rather intricate, see report (Appendix B*) attached. It is to be regretted the local board did not institute any proper inquiry into the origin of this outbreak, notwithstanding that, occurring in a large and well-known institution, it attracted much attention. The following case, which came under the notice of the Central Board during the present year, shows the great importance of dairies being well looked after. A farmer named W., not far from Melbourne, allowed large quantities of nightsoil to be deposited on his farm, where it was very imperfectly ploughed into the soil. The W. family sold milk to a dairymen named L. The farmer's son worked among the nightsoil, contracted typhoid fever, and died. His illness was not reported, and neither the W. family nor the dairymen L., according to their own statement, knew that the disease was typhoid, as the medical attendant said it was only "low fever." L. continued to take the milk for some time after the death, and one of his own children contracted typhoid. This child remained at the dairy, as, according to the father's statement, no one would take the patient. The illness of this child was not reported for three weeks, as the medical attendant said it was unnecessary. When found out, the Central Board suggested prosecution, but the local board declined, and the health officer got much obloquy for having had the courage to do his unpleasant duty. The dairymen referred to supplied 800 customers. Four cases of typhoid subsequently occurred in families receiving milk from this dairy. It is not known how many more suffered, as notification of typhoid is not compulsory. This case shows the urgent necessity for compulsory notification of contagious diseases. A very extensive outbreak might have occurred amongst these 800 customers.

Local Boards. V. Inaction of some Local Boards, and Negligence of Nuisance Inspectors.—Local boards do good service to the community, but there is a great difference among them as regards the active suppression of nuisances, and many fail to do what is required of them in the interest of the public health. It is not to be inferred from this that all local boards are inactive, or that all inspectors are negligent. Neither is it implied that those boards or officers that fail in their duty do no good. If it be said that they do their best with the means at their disposal, then it must be stated that their best is not the best. Many boards and inspectors must be fully aware that cases, both of typhoid and diphtheria, are frequently occurring and causing death, and yet nothing is done until it is too late. In fact, the insanitary conditions are remedied only after the mischief has occurred. The evil is followed, instead of being anticipated. That such is the case the records of the Central Board of Health prove beyond dispute, and the members and officers of the Board can testify the same from experience. That

* With Plan and two Schedule.
local boards have serious difficulties to contend with, especially financial ones, must be admitted. Some of these difficulties have arisen, or been increased, owing to the incapacity or remissness of former boards. The evil that men do lives after them. This is true of corporate bodies as well as of individuals. In many cases land was bought, and houses erected, without intelligent regard to proper drainage or levels. The soil became charged with filth and germs of disease. The harvest of past sowing is now being reaped. All this must be admitted, but it does not explain away the fact that much remains undone which boards have it in their power to do; and that deaths are occurring every year through negligence. We refer not to the borrowing of heavy loans, for the purpose of effecting schemes of sanitary reform on a large scale, but rather to remissness in remedying evils that could either be removed, or greatly abated, by means at command, or at comparatively little expense. If proof of this be wanted, let any competent person who doubts it visit the places where typhoid fever and diphtheria are constantly occurring, and judge for himself. The present insanitary state of the colony, as shown by the returns of the Government Statist, who deals with undisputed facts and not theories, is also conclusive that more active measures must be taken by local boards. Those who form their opinion of the sanitary state of Victoria from Melbourne have a very inadequate idea of the existing state of things throughout the colony at large. Local boards of competent men, with energetic and skilled officers to enforce the provisions of the Acts relating to public health, and especially of the amending Bill when it becomes law, could do a great deal at comparatively little expense, and produce the most marked results. Systematic inspection should be thoroughly carried out.

VI. Inadequate Remuneration and Inefficient Action of Local Health Officers. Health officers.

That there is a close connexion between these two conditions is quite obvious. It is unreasonable to expect that medical men should give their valuable time to do work for which they are not adequately paid. Besides, the work is often of a very arduous and delicate nature, requiring courage and a compelling sense of duty to carry it out. In some instances the annual salary paid by local boards would not remunerate the health officer for investigating one troublesome case. It is no wonder, then, that many cases of infection are merely reported, without being investigated and traced to their origin. If every individual case of typhoid fever and diphtheria were dealt with as it occurred, such as is done with small-pox, these diseases would soon disappear altogether. Proper remuneration would induce health officers not only to do their work but to fit themselves for doing it well, and in accordance with modern sanitary science. Health officers require special preparation and fitness for their responsible duties, no less than other experts; indeed, an experienced health officer has suggested to the Central Board that officers of health should pass an examination in State medicine before being appointed. Instead, however, of giving proofs of the need for some improvement in this direction, as seen by the antiquated and confused opinions of certain health officers which, from time to time, come under the notice of the Central Board, such as attributing cases of typhoid fever and diphtheria to "atmospheric influence," we recommend that local boards should see that their officers are sufficiently paid, and then insist upon the work being well done.

As showing that health officers, and medical men generally, require some training and special fitness for dealing with sanitary matters in an intelligent way, the following paragraph, headed "Sanitary Demonstrations to Medical Men," is inserted here from the British Medical Journal of April 30, 1887: "Some general knowledge of the modern systems of sewerage and drainage, and of the numerous novel sanitary domestic appliances, is very useful to medical men, who are often called upon to form a general opinion on the sanitary condition of a house in which cases of illness have occurred having symptoms suggesting infection by the 'filth diseases.' There is a representative collection of such appliances at the Parkes Museum of Hygiene, Margaret-street; but, without some preliminary knowledge or a competent guide, it is rather unintelligible to the ordinary visitor. To supply this want the Council of the Museum has arranged to hold three demonstrations during May, which will be open to all members of the medical profession on presentation of their cards."

VII. Badly Constructed Dwelling-houses. — It can be readily understood that the speculating builder, in erecting houses for the express purpose of sale, has an eye to cheapness and profit rather than to healthiness of site and sanitary construction. Hence
cottages are frequently built upon sites made up of town rubbish, or on wet undrained land little better than a swamp, and abutting upon streets or lanes neither paved nor drained. The practice also of dividing an estate into a number of small allotments, and occupying houses built thereon before a road is metalled, or a suitable drain provided, ought to be stopped by law. Local boards should be empowered to exercise control over the erection of buildings in regard to dryness of site, air space, drainage, mode of construction, ventilation, closet accommodation, water supply, &c. No house should be allowed to be occupied until it has been inspected by the local board's officers, and certified by them to be in accordance with sanitary laws. The same principle applies to the laying out of townships as to the erecting of dwelling-houses. Before a new township is planned, the proper department should see that the site is one that will allow of efficient drainage. For the inconsiderate way in which the township of Tungamah has been laid out in this respect, and the consequent notorious prevalence of typhoid fever at the place, see special reports in the Central Board of Health's General Report for 1887. The connexion between drainage and disease has already been pointed out in our remarks upon the sanitary state of Dantzic and Frankfort-on-the-Main.

As showing the important bearing that the proper construction of houses and their drainage have upon the public health, a Bill has been proposed in England for the examination in sanitary subjects and registration of architects, engineers, and surveyors, in order that the public may be able to distinguish between those qualified and unqualified. The necessity applies with greater force to Victoria. It is almost unnecessary to say that in this colony soil-pipe ventilation is too often ignored, and that both in theory and in practice air-disconnexion is generally misunderstood. Public buildings—hospitals, asylums, gaols, &c.—should be periodically inspected by competent persons.

VIII. The Want of Compulsory Notification of Contagious Diseases, and Want of Power to Isolate Patients.—That the absence of notification has had a most calamitous effect in allowing contagious diseases to spread in the colony will not be questioned by any person conversant with the subject. It is so self-evident as scarcely to require discussion, and the question has been practically settled by the results which have followed compulsory notification in other parts of the world.

Professor Corfield,* in speaking of the advantages of compulsory notification of infectious diseases states:—"I have been forced to the conclusion that compulsory notification is a very important sanitary measure, and a great boon to the community to whom it has been applied. The unanimous opinion of the medical officers of health is that the regulations have been of great advantage in obtaining earlier information of the existence of cases of infectious disease, and information of cases that would not otherwise have been reported. Most of them also state that assistance has been obtained in tracing the origin of outbreaks of infectious disease."

The following statements from health officers who have had experience of the working of the compulsory system in different parts of Great Britain may be useful:—Bradford: "The public strongly approve of the Act. Careless people, seeing the importance attached by the authorities to the proper treatment of infection, have amended their ways, and take much more care than formerly to prevent the spread of the disease." Chadderton: "The compulsory notification is of the very greatest value, and ought to be quickly passed for the whole country." Norwich: "I have been able to obtain valuable information as to the sanitary state of infected localities, and to remedy defects—also, in many instances, to effect isolation."

The mayor of Blackpool has said, "With its aid, we consider ourselves, under normal conditions, perfect masters of the situation."

With regard to a fear expressed that compulsory notification may lead to concealment of infectious diseases, medical officers have stated as follows:—Edinburgh: "The citizens cheerfully co-operate in carrying out the provisions of the Act. I frequently receive letters from respectable citizens inquiring if cases of infectious disease in their families have been reported by the medical attendant." Bradford: "As to the allegation that people would conceal infectious disease and not send for

---

*Transactions Sanitary Institute of Great Britain, 5th vol.
medical advice for fear of having the case reported, I can safely say that such has not
been the result in this town." The town clerk of Derby remarks: "Instead of
concealment being engendered, the contrary has been our experience."

With such testimony as that reported of the successful working of compulsory
notification in various parts of England, there should be no difficulty in bringing a
similar provision into operation in Victoria, and with like results. The power is asked
for in the Amending Bill, clause 38.*

That there is urgent need for compulsory notification of infectious disease in
this colony, the ever-recurring epidemics of measles, diphtheria, and typhoid fever
abundantly prove. It has been shown by reliable statistics that in what are called
"notification towns" in England there has been a distinct fall in the death-rate since
notification became compulsory.

Power to promptly isolate cases of infectious disease is another important
matter. There is great weight of evidence to show that in many instances in this
(colony (to say nothing of England) an outbreak of typhoid fever, diphtheria, or scarlet
fever might have been effectually checked if the local health officer could have isolated
the first patient.

To sum up—four points stand prominently forward as necessary in the
suppression of typhoid fever:—

1. Compulsory notification.
2. Isolation.
3. Prompt removal by special service and destruction of typhoid excreta.
4. General cleanliness and speedy abatement of nuisances—cleansing
drains, abolition of cesspits, and protection of potable waters.

As to the last head, the Central Board has some controlling power, but as to
the other three it has no power whatever. The local boards have power as to the
third and fourth—none as to the first and second.

Hence, it is obvious that the passing without delay of the Amending Health
Bill, in which suitable provisions are contained, is of urgent importance.

In conclusion, we beg leave to say that we have attached, as Appendix C, an
interesting monograph by Mr. T. R. Wilson, some time Secretary to the Central Board
of Health (prior to the Act of 1883).

We do not, in so attaching it to this Report, make ourselves responsible for the
views urged by that gentleman; but the interest he has always taken in sanitation,
and his experience, warrant the inclusion of his paper.

Attempts have been made, both in England and in this colony, to show that
there is a connexion between prevalence of diarrhoea and a high typhoid death-rate.
We have given in the table Appendix A, the number of deaths and the death-rate
from diarrhoeal diseases for nine years, but the figures do not justify the formulation
of any rule as regards Victoria.

All which is respectfully submitted.

A. P. AKEHURST, P.M.,
C. R. BLACKETT, F.C.S.,
W. C. KERNOT, M.A., C.E.,
J. MARMADUKE ROSE, M.B., C.M., M.P.,
A. SHIELDS, M.D.,
W. M. FEHON, J.P.,
J. DUNBAR TWEEDDALE, Staff-Surgeon
H.M.V. Navy,
GEO. COPPIN, M.P.

J. W. COLVILLE,
Secretary.

* See also Central Board's last General Report, pp. 19 and 20.
## APPENDICES.

### APPENDIX A.

#### MELBOURNE AND SUBURBS.

<table>
<thead>
<tr>
<th>JANUARY</th>
<th>FEBRUARY</th>
<th>MARCH</th>
<th>APRIL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Years</strong></td>
<td><strong>Deaths</strong></td>
<td><strong>Mean Temperature</strong></td>
<td><strong>Precipitation</strong></td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1878</td>
<td>34</td>
<td>62.8</td>
<td>29.9</td>
</tr>
<tr>
<td>1879</td>
<td>19</td>
<td>65.0</td>
<td>29.9</td>
</tr>
<tr>
<td>1880</td>
<td>8</td>
<td>65.9</td>
<td>29.3</td>
</tr>
<tr>
<td>1881</td>
<td>17</td>
<td>65.7</td>
<td>29.3</td>
</tr>
<tr>
<td>1882</td>
<td>8</td>
<td>63.9</td>
<td>29.7</td>
</tr>
<tr>
<td>1883</td>
<td>15</td>
<td>66.9</td>
<td>29.7</td>
</tr>
<tr>
<td>1884</td>
<td>18</td>
<td>65.8</td>
<td>29.8</td>
</tr>
<tr>
<td>1885</td>
<td>8</td>
<td>62.9</td>
<td>29.8</td>
</tr>
<tr>
<td>1886</td>
<td>21</td>
<td>65.0</td>
<td>29.8</td>
</tr>
<tr>
<td>1887</td>
<td>14</td>
<td>66.8</td>
<td>29.8</td>
</tr>
<tr>
<td><strong>Average for 1878-87</strong></td>
<td><strong>27.4</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MAY.

<table>
<thead>
<tr>
<th>YEARS</th>
<th>TOTAL NUMBER OF DEATHS</th>
<th>TYPHOID FEVER</th>
<th>ESTIMATED POPULATION</th>
<th>TOTAL NUMBER OF DEATHS FROM DIABETIC DISEASES</th>
<th>DIABETIC DEATH RATE PER 10,000 LIVING</th>
<th>NO. OF DAYS UPON WHICH RAIN FALL</th>
<th>RAINFALL IN INCHES</th>
<th>AVERAGE TEMPERATURE FOR THE YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1878</td>
<td>307</td>
<td>256,477</td>
<td>299</td>
<td>1 day, 0.04</td>
<td>449</td>
<td>15 days, 4.34</td>
<td>47</td>
<td>65.3</td>
</tr>
<tr>
<td>1879</td>
<td>195</td>
<td>265,000</td>
<td>736</td>
<td>6 days, 0.94</td>
<td>386</td>
<td>14 days, 3.57</td>
<td>20</td>
<td>65.7</td>
</tr>
<tr>
<td>1880</td>
<td>139</td>
<td>277,200</td>
<td>505</td>
<td>7 days, 0.75</td>
<td>353</td>
<td>11 days, 2.45</td>
<td>25</td>
<td>67.0</td>
</tr>
<tr>
<td>1881</td>
<td>15</td>
<td>286,874</td>
<td>541</td>
<td>2 days, 0.90</td>
<td>386</td>
<td>8 days, 0.94</td>
<td>32</td>
<td>66.2</td>
</tr>
<tr>
<td>1882</td>
<td>14</td>
<td>291,464</td>
<td>675</td>
<td>6 days, 1.95</td>
<td>492</td>
<td>14 days, 3.57</td>
<td>37</td>
<td>67.0</td>
</tr>
<tr>
<td>1883</td>
<td>12</td>
<td>304,300</td>
<td>724</td>
<td>8 days, 2.74</td>
<td>506</td>
<td>11 days, 2.45</td>
<td>41</td>
<td>66.7</td>
</tr>
<tr>
<td>1884</td>
<td>7</td>
<td>312,650</td>
<td>681</td>
<td>8 days, 2.74</td>
<td>384</td>
<td>8 days, 0.94</td>
<td>32</td>
<td>66.2</td>
</tr>
<tr>
<td>1885</td>
<td>9</td>
<td>345,380</td>
<td>729</td>
<td>8 days, 2.74</td>
<td>485</td>
<td>14 days, 3.57</td>
<td>37</td>
<td>67.0</td>
</tr>
<tr>
<td>1886</td>
<td>12</td>
<td>371,850</td>
<td>737</td>
<td>14 days, 2.67</td>
<td>591</td>
<td>11 days, 2.45</td>
<td>32</td>
<td>66.7</td>
</tr>
<tr>
<td>1887</td>
<td>1</td>
<td>221</td>
<td>476</td>
<td></td>
<td></td>
<td></td>
<td>28</td>
<td>65.9</td>
</tr>
</tbody>
</table>

* The proportion of deaths during the second half of the year as against the first may be stated as one to three.

** Average for Victoria for some period = 9.15.**
TYPHOID FEVER  Comparison of VICTORIA with MELBOURNE and SUBURBS

Population thus | Number of deaths thus | Death rate per 10,000 thus | V. Signifies Victoria  M. Melbourne and Suburbs

![Graph showing comparison of typhoid fever in Victoria, Melbourne, and Suburbs over years 1878 to 1886.](image)

**SCALE**

- Population: 1 inch = 200,000
- Number of deaths: do. = 400
- Death rate: do. = 20

10,000

Each vertical space = 20

1

GEO. JAS. BUTLER, C.E.,
Asst. Inspector.
I have the honour to report that Mr. Butler and I visited the Geelong Grammar School, 30th May, 1887, and began to investigate the cause of the recent outbreak of typhoid fever in that institution. We first inquired into the sanitary condition of the school itself, and then endeavoured to ascertain whether there were any grounds for the opinion, entertained by some, that the fever was imported by means of polluted milk.

SANITARY STATE OF THE SCHOOL.

For the sake of distinction, the internal arrangements of the institution may be classed under three divisions, viz.: the head master and his family, the boarders, and the domestic servants. We found that typhoid had occurred in each of those departments, viz.: one case in the head master’s family, five among the servants, and eighteen among the boarders. The number of the boarders at the time of the outbreak was sixty-three. By referring to Schedule A, it will be seen that the outbreak was virtually simultaneous in all three divisions of the establishment. This point will be referred to again.

CLOSET ARRANGEMENTS.

The pan system is in use for the boarders, and has been so for years. Hunter’s disinfectant is supplied. The servants’ closet has also a pan. The pans are supposed to be emptied twice a week by the night-service of the town, but the head master has had cause to complain of some irregularity in this matter. There is also a night-closet convenient to the dormitories, which is intended for use after 10 p.m., but it appears that the boys found access to this closet at other times, which caused the pan occasionally to overflow. The head master’s apartments are supplied with a water-closet placed inside the house. The pipe from this closet finds an outlet into two large cesspools (17 feet deep) in the garden. These are built over with brick and covered with earth, on the same level as the other parts of the garden grounds. The one cesspool is constructed so as to receive the overflow of the other. Neither of them has been emptied for several years. As these cesspools are substantially covered in, there is no outlet for the fetid gas generated by decomposition, except along the soil-pipe leading to the closet. Indeed, the two cesspools act as generators of sewage gas on an extensive scale, the product passing into the house in continuous supply. Hence, each time the closet is used the contents sent down displace a certain amount of noxious effluvia. At the time of our visit, the closet was put into action to test this point, and the characteristic odor of night-soil was strongly perceptible from the unventilated soil-pipe. As the closet is within the house, the soil-pipe ought to be both ventilated and air-disconnected; but the cesspools are a grave blunder, and ought to be abolished altogether. It would be an improvement also if the earth-closets were self-acting, especially those for the boarders. The night-closet for the boys should be reconstructed. An intervening air-lobby is required to keep everything fresh and wholesome.

DRAINS.

The drainage from the kitchen, laundry, urinals, and the school generally passes along underground drains into the street channels. As these underground drains are of considerable length, they should be ventilated, and also tested occasionally for leakage, which can be very simply done by blocking up the mouth or outlet of the drain, filling it with water, and observing whether any escapes. Ventilation should be also applied to the pipes for carrying off roof water when they lead into underground drains, as they do at the Geelong Grammar School. In such cases sewer gas is apt to pass up the pipes, and escape at their leaking joints. It is a good sanitary principle that all pipes carrying away waste water from kitchens, baths, lavatories, urinals, &c., should be well ventilated and air-disconnected.

WATER SUPPLY.

This is from two sources. For baths and general use the water is from the Stony Creek reservoir, which supplies Geelong; but, for drinking, rain water from slate roofs is used. This is collected in iron tanks above ground. It is uncertain when these tanks were cleaned out. Below the laundry, there is also an underground tank containing water, which is used only for laundry purposes. The pump of this tank is inside the laundry and the door is kept locked except when in use, and we were assured that the boys never drank this water. A sample of water, from each tank, has been handed over to the Government Analyst for examination. The result is given in report attached. The head master could not account for typhoid fever breaking out in the institution, and thinks the infection must have been imported from outside. He assisted us greatly in our inquiries, and afforded us much exact and valuable information, which we thankfully acknowledge. In our remarks upon the insanitary condition of the school, we have had occasion to point out some things which are not in accord with health science, but we are satisfied, from the spirit manifested at the time of our visit, that all improvements necessary for the good health of those residing in the establishment will be promptly and thoroughly carried out.

Having thus far described the general internal arrangements of the institution, and its hygienic defects, we come now to consider the question of causation:—Did the outbreak of fever originate within the school, or was the typhoid poison imported? We have shown that the sanitary conditions were not perfect, especially as regards the water-closet in the private apartments, but there is no reason to believe that the disease arose from that or any other cause within the establishment. The evidence shows very conclusively, we think, that the typhoid poison was conveyed from without. No other view will satisfactorily explain all the circumstances connected with the extent and simultaneousness of the outbreak.

It has already been mentioned that all the three divisions of the institution were affected; the head master’s wife, the boarders, and the servants. The cause must therefore have been common to the whole No. 97.
establishment. No case of typhoid fever had previously occurred in the school for two years, and that was a single case of one of the boarders, where the pan-closet has been in use since before that period. There had been no history of previous outbreak. The opening of cess-pits, cleaning of drains, etc., had been looked into, but without any result.

Dr. Cayley, physician to the London Fever Hospital, thus writes in his Croonian lectures on typhoid fever, for 1880—"I have recently seen a very severe case of typhoid, in which the premonitory symptoms lasted for a fortnight before the occurrence of rigor and the definite onset. In this case there was a sudden increase in the severity of these symptoms, and a patient was referred to me on the 10th day, and died on the 11th. The premonitory symptoms, which were very slight in appearance, were very slow in developing, but the onset of the disease was very abrupt.

From these cases, we return to the others already mentioned, and tabulated in Schedule A. In order to understand the full meaning of these dates and numbers in connexion with the point under consideration, it is necessary to bear in mind that the incubation period in typhoid fever is very variable. In this respect typhoid, like scarlet fever, differs from measles and small-pox, which are pretty constant in their incubating period. It is generally accepted that the incubation period in typhoid is about fourteen days, while Trueman gives the disease as communicated by drinking water, but considerable variation occurs, and an incubation of twenty-one days is not infrequent when the infection has been caused by contaminated water or milk. As the variability of the incubation period has an important bearing on the simultaneousness of the outbreak in the Geelong school, we shall quote two sentences on this subject from Dr. Cayley's lectures already referred to:—"Often much difficulty is experienced in fixing the exact date of the onset of the disease, and to this many of the apparent deviations from the usual period are due. That the variability of the incubation period is due in many cases to some peculiarity on the part of the patient, and not to any difference in the state of the poison, or in the manner in which it is introduced, is manifest from the fact that it usually happens, when several persons are exposed at the same time and in the same manner, that they fall ill at very variable intervals." Considering, then, that 25 inmates of the establishment were in effect attacked at about the same time, and that the disease extended over all the departments of the institution, we conclude that the cause must have been common to the whole school. This is a point which we venture to affirm cannot be gainsaid. Now, no such common cause is known to have existed within the institution at the period under consideration. The same conditions, sanitary or otherwise, obtained previously which obtained during the period under consideration. How then, is it possible to prove that the outbreak did not originate the disease before, if it was due to some insanitary state within the building? It would be strange, indeed, if it so happened that all the departments became infected at the same time without anything to account for this remarkable coincidence except what had been the ordinary condition of the school previously. On the other hand, one common cause of infection explains everything peculiar to the outbreak, and, as this was not found within the establishment, it must be looked for without. It is no satisfactory explanation to say that some of the last cases might be infected from the first. Even allowing, for the sake of argument, that one or two of the last patients were so infected, this would not account for either the first or the great majority of the cases. We come now to consider the evidence for the view that the typhoid poison was conveyed in the milk. The school has been supplied with milk from Trueman's dairy for many years. No case of typhoid had been known to occur at this dairy, and there is not the slightest suspicion that Trueman's own milk was to blame. The water at this dairy has also been examined, and found wholesome. (See report on this water, by the Government Analyst, attached.) Trueman, however, was in the habit of getting a little milk, proportionally, from a relation named Chilwell, of one of the suburbs of Geelong. It is true that Trueman is very emphatic that the Grammar School never got any of Stokes's milk, which was but a small quantity at the most, and which Trueman affirms was either used in his own household, or by only two of his customers. This may be admitted; but, nevertheless, the milk from Stokes's dairy was taken home in one of Trueman's cases, as will be explained further on.

It is unnecessary to go into details to prove that milk may be readily poisoned with typhoid germs, by being put into a vessel that has just shortly before contained contaminated milk, if the vessel has not been scalded in the interval. At this point, however, we must briefly refer to the way in which, we believe, Stokes's milk itself became infected. There were two possible sources. Stokes himself suffered from typhoid fever, and was taken to the hospital on the 15th April. He states that he was not feeling well from the 10th to the 12th of that month, and on the 11th (Easter Monday) "felt queer and had pains in head and back." Urgent business took him into the country on the 12th; and on the 15th, while still in the country, the bowels were "very loose." He returned home on the evening of the 14th April, and went to the hospital the next day.

Besides this possible source of infection, there was another which must not be overlooked. A family named K—, living quite near, on the opposite side of the street, was supplied with milk from Stokes. In this family typhoid fever had existed from March till towards the end of April. Three members of this family suffered from typhoid, and one case proved fatal. The last of the three cases was out of bed, and able to be about on the 30th April. Stokes sometimes delivered the milk, and other times the family sent for it. The two families were on friendly terms, and visited each other. To give the homes an idea, yet significant phrase used by one of themselves when giving me some details, there was "going backwards and forwards" between the two families. Probably more importance, however, is to be attached to the jug that conveyed the milk than to friendly intercourse. These qualified to judge in such matters will admit that the moist inside of a vessel that has been emptied of milk is a very likely means of carrying typhoid germs. Before going on to show how Stokes's milk infected Trueman's, we may here answer a question that very naturally arises, viz.:—Did any of Stokes's own customers become infected from the milk supplied to them? In the first place, Stokes had only one cow in milk up to the time he went to
the hospital, and afterwards two; consequently, his customers were limited. Then, as he had no proper dairy for keeping milk, the families would be served shortly after milking. If, therefore, the milk was taken straight away without coming in contact with the jug used for the K— family, there would be no contamination. On the other hand, it was always after Trueman had finished the morning delivery to his numerous customers that he occasionally called at Stokes's, on his way home, about an hour after Stokes's customers had been served. As the two families were related, and on friendly terms, they had been in the habit of "giving and taking" milk for years, and Mrs. Trueman had the privilege of calling and getting milk from Stokes even when Stokes was out. It may appear to some rather unlikely that Trueman should have chance to get contaminated milk when Stokes's own customers received it. We know, however, that the unlikely does sometimes happen, and that very awkwardly. Three factors may be required to produce a certain result. So long as only two are at work, there may be risk only, and this state of danger may continue for a longer or shorter period, but it is not till the third agent is brought into co-operation with the other two that the accident occurs. Then, looking backwards, after the disaster has taken place, it is seen what remarkable risks and narrow escapes have been run, and that too for a considerable time. The accident, therefore, is not one of a hundred, or more, only due to the risk of factors, or combination of circumstances, which led up to and caused the unfortunate result, may have been very accidental, and even an unlikely occurrence beforehand. Frequent experience in the various affairs of life shows that the unexpected and unlikely happen too often, and therefore any argument drawn from such premises cannot be advanced against an opinion that it is perfectly reasonable in itself. There is nothing really absurd in the view, or physically impossible in the circumstances, that the portion of milk which Trueman got from Stokes may have been contaminated on one or two occasions only, and yet another portion of Stokes's milk, given to his own customers, at an earlier hour, and in different circumstances, may have escaped, although very narrowly. It must be borne in mind that the milk which Trueman got at Stokes's might be contaminated only a very few times, possibly not more than twice or so, as the simultaneousness of the outbreak tends to show. There is also one rather peculiar coincidence which should be here noticed. A family named R— got their milk from Stokes; the milk was always scalded, nevertheless one of the family, a boy, aged 12 years, took ill, and, after a protracted premonitory stage, was laid up with typhoid on 1st May. We learnt, however, that this boy was in the habit of bringing home the family milk, which Trueman got from Stokes, which of itself was unscalded. Mrs. R— said that the boy got the infection in some other way, as typhoid was in the neighbourhood. As the point is one of probability, the question is— which mode of infection was the more likely? It should be understood, however, that it is really not necessary to prove how, or from what source, Trueman's milk was contaminated. It is enough to show that the disease did not originate from any cause within the school, and that there is reasonable 'evidence that the milk was the true cause. Dr. Ashburton Thompson, Chief Medical Inspector to the Board of Health, Sydney, puts the case thus, in a "Report on an Outbreak of Typhoid Fever in New South Wales in 1886":— "If all these causes (viz., defective drainage, closets, water supply, &c.) can be excluded, the milk supply must be examined; and then, if the incidence of disease is found to be greater upon people known to be supplied from a common source than upon others around them, it is certain that the suspected milk is the vehicle of contagion, and the end of the inquiry is reached. It will be seen that it is unnecessary to show it became polluted; still more unnecessary to show how the specific poison of typhoid fever reached it. That it did reach it is made abundantly clear by its having caused that disease in those who ate of it. Nevertheless, the source should always be carefully sought, although it will often be found impossible to discover it." Coming now to Trueman's customers, we found one very striking peculiarity, viz., that all those who got milk only in the morning—and these were by far the majority—were, without exception, free from typhoid, while those who suffered from fever were either supplied in the evening, or both morning and evening. The Grammar School received milk both morning and evening. On further inquiry, it was ascertained that Trueman always brought home Stokes's milk in the forenoon, after the morning delivery, and never in the evening. Hence, if the milk which Trueman used in the evening was contaminated, it would be Trueman's evening customers that would suffer. We have previously stated that Trueman affirmed very positively that the Grammar School never got any other milk except his own. Granting this, it is admitted that Stokes's milk was brought home in Trueman's milk vessels. Quantity is immaterial. So far as infection is concerned, it was enough that Trueman's sound milk was put into an unscaled can that had contained poisoned milk. This was the point of contact between the two dairies. We were careful to learn whether the cans used to bring home Stokes's milk had been thoroughly scalded, and satisfied ourselves they were not. It is not our wish to make any reflections upon the cleanliness and good management of Trueman's dairy. His own milk and water supply (see analysis attached) were wholesome, but he was not aware that there was any danger in getting a little milk from a friend, and hence was not on his guard. Trueman's milk was taken out for delivery in a 50-quart can. Smaller vessels of ten and five quarts, and some still less, were used for distributing the milk. Stokes's milk was always brought home either in the ten or five quart vessels, because the water was first put into the large 50-quart can and then into the smaller ones. As the water would rapidly part with its heat in the large vessel, the two smaller ones could not in any true sense have been scalded or disinfected. Then it is possible that on one or two occasions the two smaller cans may have been overlooked, and not washed at all, owing to some slip or mistake. Another question arises here—may the lids of the two cans used in bringing home Stokes's milk not have been forgotten sometimes in washing the milk vessels? It is well known to chemists and analysts, accustomed to such vigilance, that, even with the greatest care, accidents do occur from sheer oversight; and the unavoidable occurrence of such mistakes, as regards perfect cleanliness will contribute to vitiate results in a very matter of fact way. Slight mistakes leading to grave consequences have a wide application in everyday life.

The ten and five quart cans were always used for carrying in the milk to the Grammar School. We have already pointed out the marked difference between those who were only morning customers and the others who received their supply both morning and evening. A further and important distinction we found to exist between those evening customers who had their milk delivered in one or other of the two cans which Trueman used in taking home Stokes's milk and the other evening customers who had their
supply delivered in some of the lesser vessels. Here, again, we notice the remarkable coincidence that typhoid was found only amongst those whose milk came in contact, in some way, with the cans that had contained Stokes’s milk.

Besides the Grammar School proper, which formed the chief subject of our inquiry, we found that cases of typhoid had also occurred in the Junior Grammar School (a separate branch of the former), and in two private families, which we shall distinguish as X and Y.

Both the Senior and Junior Grammar Schools, and also the X family, had their milk delivered in one or other of the two cans used by Trueman for taking home Stokes’s milk. The Y family, too, had their milk delivered in a vessel that came directly in contact with Stokes’s milk.

On referring to Schedule B, the number of cases in these families, and the dates of attack, will be seen at a glance, and therefore a detailed description here is unnecessary. It should also be mentioned that in the Junior Grammar School there was nothing except the milk to account for the cases of typhoid that occurred there. Every person that suffered from the disease in both schools had used the milk, and there was a special case in the senior school which deserves notice. The head master’s wife was not in the habit of taking milk by itself, but, owing to private circumstances, she had occasionally taken a small glass of milk in the evening, between the 20th and the end of April. She sickened with typhoid on the 5th May. Another most convincing proof in support of the view that the outbreak at the Grammar School was due to typhoid poison in the milk is supplied by a striking coincidence that occurred in the X family. A little girl named C. Z visited the X family on the 30th April. She took milk (Trueman’s) in tea, and also drank a cup of milk as delivered. She was taken ill with typhoid fever about the 15th May. The family consisted of five children, ranging from 2 to 14 years of age; also a housemaid 18, and a nurse-child 15 years old. None of these suffered. The Z family did not get their milk from Trueman. There can be little doubt that C. Z contracted the disease on the occasion of her visit to the X family on the last day of April. The same conditions at home were common to all the Z family, and only C. had the fever. On referring to Schedule B, it will be seen that three of the X family had typhoid fever, one about the 14th May (same time as C. Z), and the other two on the 22nd May. The X family had their milk delivered in one of the cans that had contained Stokes’s milk, as already stated.

The Y family, who got an evening supply of milk, had three children ill with typhoid fever about the first week of May (see Schedule B). This family had their evening milk delivered in a quart measure, which Trueman was in the habit of putting in the same can along with Stokes’s milk, when taking it home; and it is worthy of remark that the Y family were the first of the evening customers that had their milk delivered in this quart measure.

What was done with the milk that Trueman took home from Stokes’s dairy? Trueman says that it was only occasionally that he got Stokes’s milk, and that some of it was used in his own family, and some given to two customers, A and B, who, however, according to explanation, had it only three times, and all within four days. There was no fever in these two families; but, apart from insusceptibility, there is no reason to suppose that the milk got from Stokes’s was always contaminated; and, as the two families, A and B, had it only three times, it is quite possible that it was sound on these occasions. Besides, it is a mistake to suppose that all who partake of infected milk suffer from the fever. Dr. Ashburnham Thompson writes thus:—"But, supposing the infection of milk has been thus proved, should not all the persons in the daily habit of consuming it be expected to fall ill, due allowance being made for the aged, and for those who, having already had the disease, are not so likely to take it again? Experience shows that it does not fail out so, a proportion only of those thus exposed to the cause of illness suffering; usually a somewhat large proportion, it is true, but never more than a fraction of the total. Further, the mortality of typhoid conveyed in milk seems usually to be smaller than when it is conveyed in other ways." 

No deaths occurred amongst the Geelong cases.

We made inquiry also about the butter supplied to the Grammar School, but found no evidence that it had anything to do with the outbreak of the fever. The firm supplying the butter knew of no case of typhoid amongst their other customers at the period under consideration. The X and Y families were not customers of the firm supplying the Grammar School.

In conclusion, we may mention that a slight error which crept into the Progress Report, with reference to the exact position of the night-closet connected with the dormitories, has now been corrected. It may further be stated that the water-closet cesspools have been abolished, and that other useful sanitary improvements, as regards drainage, closets, ventilation, the dormitories, &c., have been effected throughout the building. We beg also thankfully to acknowledge the services of all those who assisted us in our tedious inquiries. Dr. Carstairs gave much attention to the subject, and, although he takes a different view from that embodied in this Report, as to the cause of the outbreak, we willingly testify to his great courtesy and kind co-operation.

(Signed) A. SHIELDS, M.D.

Referred to Mr. Butler for his perusal and any remarks he may think fit to add.

Memo to Dr. Shields.—Having read the above Report, I fully concur with your conclusions.—Geo. JAS. BUTLER, C.E. July 16th, 1887.

Melbourne, June 8th, 1887.—To A. Shields, M.D., &c., Chief Medical Officer.—Sir,—I have the honour to report that I have carefully examined and tested the five samples of water from the tanks at the Geelong Grammar School, which you submitted to me last Friday, 2nd instant:—No. 1 tank is slightly coloured, No. 2 tank is slightly coloured, No. 3 tank is white, No. 4 tank is white, No. 5 tank is white. All the samples contain traces of chlorine: No. 5 (laundry) the most. The samples were submitted to test for water; the results were negative. The waters are all as pure as carefully-collected rain is. No. 4 is the only one which ought to be rejected for drinking purposes, as it contains some organic matter, and became quite cloudy under the fermentation test. No suspicious forms of fungoid life, however,
were found. My general conclusion is that none of these waters contain any trace of dangerous germs, and
the rejection of No. 4 is recommended on the principle of caution.—Yours faithfully, C. R. BLACKETT,
F.C.S., Government Analyst.
Dr. A. Shields, Chief Medical Officer.—Sir,—I have the honour to report that I have chemically
and otherwise examined the water from the tank at Trueman's dairy, with results which prove that the
water is quite free from anything which would indicate sewage or other contamination. I consider that it
is perfectly wholesome.—Yours faithfully, C. R. BLACKETT, F.C.S., Government Analyst. June 30th, 1887.

SCHEDULE A.
SHOWING Dates and other Details relating to Outbreak of Typhoid Fever in the Grammar School,
Geelong, May 1887.

<table>
<thead>
<tr>
<th>Name (Initiales)</th>
<th>Age</th>
<th>Sex</th>
<th>Date of last Admission to School</th>
<th>Date of Attack</th>
<th>Kind of Closet</th>
<th>Water Supply</th>
<th>Milk, how used, &amp;c.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. E. R. ...</td>
<td>14</td>
<td>M</td>
<td>18 April ... 2 May</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. W. ...</td>
<td></td>
<td>F</td>
<td>18 April ... 2 May</td>
<td>Pan ...</td>
<td></td>
<td>Took milk as delivered from 26th to 30th April</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K. M. ...</td>
<td>17</td>
<td>F</td>
<td>6 May ...</td>
<td>W. C.</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M. C. ...</td>
<td>16</td>
<td>F</td>
<td>6 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. H. ...</td>
<td>19</td>
<td>M</td>
<td>10 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M. R. ...</td>
<td>15</td>
<td>M</td>
<td>10 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. J. A. ...</td>
<td>15</td>
<td>M</td>
<td>10 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T. F. ...</td>
<td>17</td>
<td>M</td>
<td>11 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. G. ...</td>
<td>17</td>
<td>M</td>
<td>11 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. S. ...</td>
<td>16</td>
<td>M</td>
<td>11 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. A. ...</td>
<td>13</td>
<td>M</td>
<td>11 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. R. ...</td>
<td>17</td>
<td>M</td>
<td>11 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. B. ...</td>
<td></td>
<td>F</td>
<td>11 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M. K. ...</td>
<td></td>
<td>F</td>
<td>11 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. C. ...</td>
<td></td>
<td>M</td>
<td>12 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. F. ...</td>
<td>14</td>
<td>M</td>
<td>12 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. S. ...</td>
<td>17</td>
<td>M</td>
<td>13 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. W. C. ...</td>
<td>17</td>
<td>M</td>
<td>13 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. C. ...</td>
<td>17</td>
<td>M</td>
<td>13 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. B. ...</td>
<td>18</td>
<td>M</td>
<td>14 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. C. ...</td>
<td>13</td>
<td>M</td>
<td>14 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M. S. ...</td>
<td>17</td>
<td>M</td>
<td>14 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H. N. ...</td>
<td>16</td>
<td>M</td>
<td>16 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. A. T. ...</td>
<td>19</td>
<td>M</td>
<td>16 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph. ...</td>
<td>8</td>
<td>M</td>
<td>23 May ...</td>
<td>Pan ...</td>
<td></td>
<td>Extra milk as delivered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N.B.—Every person named in this Schedule took Trueman's milk, unscalded. The females referred to in Schedule A were principally young persons.

SCHEDULE B.
SHOWING particulars respecting persons outside the Grammar School who were supplied with milk from
Trueman's dairy, and who suffered from Typhoid fever about the same time that the outbreak occurred
in the School.

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Date of Attack</th>
<th>Kind of Closet</th>
<th>Water Supply</th>
<th>Dairy supplying Milk</th>
<th>Milk, how taken, &amp;c.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Y.</td>
<td>10</td>
<td>F</td>
<td>2 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Premenitory stage protracted, but sent home from school ill on 6th May. The Y. family regularly supplied with Trueman's milk, and taken unscalded, but had occasionally milk from two other sources.</td>
<td></td>
</tr>
<tr>
<td>R. Y.</td>
<td>7</td>
<td>F</td>
<td>2 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>H. Y.</td>
<td>10</td>
<td>M</td>
<td>8 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>F. K.</td>
<td>8</td>
<td>M</td>
<td>8 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>T. E.</td>
<td>6</td>
<td>M</td>
<td>15 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>W. S.</td>
<td>11</td>
<td>M</td>
<td>22 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>H. T. E.</td>
<td>33</td>
<td>M</td>
<td>See remarks</td>
<td>Pan</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>A. X.</td>
<td>14</td>
<td>F</td>
<td>14 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>C. Z. visited the X. family 29th April, and used Trueman's milk as delivered. A number of other young persons in the Z. family, all subject to same domestic conditions, but none of them had typhoid. Z. family not supplied by Trueman.</td>
<td></td>
</tr>
<tr>
<td>C. X.</td>
<td>20</td>
<td>F</td>
<td>22 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>J. X.</td>
<td>11</td>
<td>F</td>
<td>22 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
<tr>
<td>C. Z.</td>
<td>4</td>
<td>F</td>
<td>13 May</td>
<td>Town</td>
<td>Pan</td>
<td>See remarks</td>
<td>Unscalded.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C.

Chief Secretary's Office,
Melbourne, 6th September, 1887.

DEAR AKEHURST,

I send you a copy of the paper on the "Specific Fevers" which I read before the "Social Science Congress" of our Exhibition in 1880, and about which you and I were lately speaking.

It was, as you know, amongst those selected for printing with the records of the Congress, but was, with the others, destroyed at the fire in the Government Printing Office. The copy I send you, which is taken from my rough MS. notes, reproduces, however, with sufficient accuracy the paper as read.

I left my post of Secretary to the Central Board of Health two months or so after I wrote this paper. I have, consequently, not since had either the time or opportunities I previously possessed of noting the progress of medical opinion on the question I wrote about; but I have never lost my interest in the subject; and from what has since come under my notice in my spare moments, I venture to think that the views I put forth seven years ago have since then been receiving an increasing support from competent medical authorities.

At all events, if you think fit to lay the paper before the Central Board of Health, it may be of use in, at the least, promoting discussion in regard to the prevention of the spread of typhoid fever, a matter which, I learned to-day, is now receiving the Board's special attention.

Believe me,

Your very faithfully,

A. P. Akehurst, Esq., President of the Central Board of Health.


I desire to submit to the Congress a few remarks on a subject that has long attracted a good deal of my attention, namely, the little effect which the efforts of sanitary authorities, both here and at home, have, so far, had in lowering the mortality from what are known as the "specific" fevers.

To begin with, the very able and lucid address of the President* of this Section has sufficiently established the fact which I take as my text, namely, the failure of our efforts to lower the death-rate from preventable disease; and it is from a very strong conviction that this failure can be accounted for more satisfactorily than appears to me to have yet been done that I venture to submit these remarks on the subject.

The deaths in this colony during the last eleven years from the "specific" fevers—Typhoid, Diphtheria, Scarlet Fever, Measles, and Whooping Cough—numbered 19,490, or 15 per cent. of our total mortality for that period; and what I now confine for is this:—(1.) That what are generally known as works of "sanitary improvement" can be but of little use in preventing the spread of those diseases; (2.) That in all cases those diseases arise, in one way or another, from some previous case; (3.) That the germs of those diseases do not multiply in drains, sewers, or cesspools, or, in fact, outside the body of the patient; and, (4.) That it is to prompt isolation of the first cases, followed by efficient disinfection, that we must look for the means of controlling them.

While putting these statements thus boldly forward, I am not unaware that, with respect to some of them, and especially as to statement (3), an opposite view is held by some authorities; but, at all events, I hope to be able to show that the tendency of enlightened opinion is strongly in the direction of the view which I advocate.

Already, within the last few years, the English Statute Book, and our own, have—although, it is true, as yet in a tentative way—recognised the fact that it is on prompt isolation and disinfection that we must rely for preventing the spread of infectious disease. Laws, for instance, have lately been passed:—

(1.) For preventing communication with persons suffering from infectious or contagious disease.

(2.) For providing hospitals for their isolation.

(3.) For preventing the letting of infected houses, and the careless transport of infected bedding or clothing.

(4.) For the disinfection, not only of infected articles of bedding and clothing, but of public conveyances in which infected persons may be found to have travelled. In addition to this, recent English legislation has authorized local bodies to compel householders to report to them all cases of infectious disease, and already several cities and towns (e.g., Edinburgh and Norwich) have availed themselves of the powers thus given, and have passed local Acts for the purpose.† I may also draw attention to the fact that a further step in this direction has recently been taken in Ireland, where, under the late Irish Health Act, parents are forbidden to send to school any child who has had infectious disease within three months, unless the child produces a medical certificate of freedom from infection.

* Dr. McGean.
† The following extract from the Lancet shows that in England the necessity for local contagious diseases hospitals is becoming more and more recognised:—"These institutions are now to our communities, and the latter have not yet had time to become acquainted with the advantages to be derived from them. It is surprising, however, in how many instances, where thoughtful care has been exercised, the objections to entering sanitary hospitals have been overcome."—Lancet, 4th September, 1880.
That these additions to the law have only lately been made is, I submit, mainly owing to a lately-growing recognition of the fact that only in this way is the spread of the "specific" fevers to be prevented.

In submitting these views, I desire to be as brief as possible, but I may perhaps be permitted one or two illustrations:

It will not be disputed by any medical authority that, for the purpose of my argument, the "specific" fevers—small-pox, typhoid fever, scarlet fever, diphtheria, measles, &c.—stand in the same category. Taking, then, the small-pox, as is generally represented of the class, I would remark that no one now-a-days would assert that small-pox can be arrested by any but sanitary arrangements; and I contend for this—That all the "specific" fevers stand practically on the same footing in this respect, that is, that they can arise only where the infection has been got, in one way or another, from a previous case.

The infection of most of these fevers spreads so readily, and in most cases so unaccountably, that it is rarely that the connexion between the cases can be traced; and even with small-pox it is a well-known fact that of the thousands of cases admitted to the London Small-pox Hospital very few are able to say how they caught the disease, most of the patients attributing it to wet feet, catching cold, &c.

If this is the case with small-pox, can it be wondered at, that with typhoid fever, diphtheria, scarlet fever, and the other "specific" fevers which are so readily and, as I have said, in most cases so unaccountably conveyed, their appearance is attributed to some defective sanitary arrangements? The fact that it is a wide-spread belief that most of these diseases do so originate is attested by the numberless complaints made to the Boards of Health and to the public papers, where the complainants invariably attribute the outbreak of even the "specific" fevers to the existence of nuisances in their neighbourhood; and perhaps I cannot give a better illustration of this than by mentioning the fact that not long ago a country correspondent of a Melbourne journal attributed a local outbreak of scarlet fever to the neglected remains of a dead cat!

On the other hand, and as showing how even the most perfect sanitary surroundings are powerless to save a household from a deadly invasion of infectious diseases, I would refer to the case mentioned in the Sixteenth Report of our Central Board of Health, where it is recorded that a resident of Healesville (a hamlet, perhaps, the most salubrious part of the colony) visited Melbourne during the scarlet fever epidemic of 1875, carried the contagion with him to his home, and, in the space of two or three weeks, lost six children from this disease, and this in the face of the fact that his house was a well-built one, was in a high, well-drained and healthy situation, and that, in fact, his sanitary surroundings were in every way as perfect as the face of even the best

If there is truth in the principles which I here venture to advocate, a general and enlightened recognition of them should not lead to a disregard of those sanitary improvements which not only undoubtedly save us from many other diseases, but which also so largely contribute to our comfort and well-being; and as to any underlying fear that, if the public once learn that the "specific" fevers which add so largely to our mortality are not really controllable in this way, they may look upon works of "sanitary improvement" as needless, why I can only say, "Magna est veritas et praevalebit!"

I am by no means blind to the many difficulties which, in a free community like ours, must be encountered in preventing communication with infected persons, and in enforcing disinfection; but if there is truth in what I contend for, the sooner we face those difficulties the better. Steering in a wrong direction, to any underlying fear

And now a word as to the practical application of the principles here advocated. Already, as previously stated, our Statute law gives the sanitary authorities very considerable powers in the direction indicated. That this legislation is only recent, and that it is, as I have already mentioned, the result of the growing recognition of the fact that in this way only can we hope to prevent the spread of the "specific" fever, should encourage us to further efforts in this direction. Of the defects in the law, which yet remain to be remedied, one of the most important is the want of power to compel the report to the local authority of all cases of infectious disease; but, seeing that there is now an English precedent for such a law, I cannot doubt that before long we may hope to see an amendment here.

The late measles epidemic has forcibly shown how very little Boards of Health can really do to stay the spread of infectious disease, when, as in that instance, the first cases are not reported until the infection has spread far and wide, and got practically beyond control; and, indeed, without dwelling further on this point, it is sufficiently obvious that the compulsory report of cases of infectious disease becomes an absolute necessity if the principles here contended for be established.

Although the law, even now, enables the local boards to provide contagions diseases hospitals and means of disinfection, it is true that, notwithstanding the efforts of the Central Board of Health, in only a few places have such hospitals been provided, while in none have the local authorities as yet supplied the
public with the means of disinfection. Legislation on both points is, however, comparatively recent, and I cannot but think that this neglect of the local authorities is owing greatly to the fact that their constituents, the public, do not yet see that it is only by isolation and disinfection that the spread of the "specific" fevers can be prevented. I venture to hope that the time is not far distant when every town of importance will be provided with the means of isolation and disinfection, and it may be as well perhaps to mention here that the Central Board of Health have already furnished the local boards throughout the colony with plans of hospitals for cases of infectious disease, and have further lately announced that there will shortly be issued to the local authorities plans of a disinfecting apparatus, both structures being of an inexpensive description, and therefore within the reach of any community.

There are several other points on which I should like to remark did time permit. I can only now, however, offer my apologies for submitting a paper hurriedly prepared, and in doing so say that, imperfect as these notes are, I shall be well satisfied if they should lead to a further discussion by abler hands than mine of a subject which, it must be admitted, is of the most vital importance to all of us.

T. R. WILSON,
Secretary to the Central Board of Health.

21st October, 1880.