Dr Hugh A. Macewen's report to the Local Government Board on an outbreak of enteric fever in Ringwood, 1912.

FOR OFFICIAL USE.

REPORTS

TO THE

LOCAL GOVERNMENT BOARD

ON

PUBLIC HEALTH AND MEDICAL SUBJECTS.

(NEW SERIES NO. 74.)

Dr. Hugh A. Macewen's Report to the Local Government Board on an Outbreak of Enteric Fever in Ringwood, 1912.

LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.
To be purchased, either directly or through any Bookseller, from
WYMAN AND SONS, LIMITED, FETTER LANE, E.C., and
54, ST. MARY STREET, CARDIFF; or
H.M. STATIONERY OFFICE (SCOTTISH BRANCH),
23, FORTH STREET, EDINBURGH; or
E. PONSONBY, LIMITED, 116, GRAFTON STREET, DUBLIN;
or from the Agencies in the British Colonies and Dependencies,
the United States of America, the Continent of Europe and Abroad of
T. FISHER UNWIN, LONDON, W.C.

PRINTED BY
DARLING AND SON, LTD., BACON STREET, E.
1912.

Price Ninepence

Dr. Hugh A. Macewen's Report to the Local Government Board on an Outbreak of Enteric Fever in Ringwood, 1912.

ARTHUR NEWSHOLME,
Medical Officer,
6th December, 1912.

The subjoined report, on inquiries made by instructions of the Board into the circumstances of an epidemic of enteric fever in the small town of Ringwood, situated in the rural district of that name in the county of Hampshire, is divided into three parts as follows:—

I. Sanitary circumstances of the rural district of Ringwood, so far as relevant to the inquiry.

II. Circumstances and causation of the epidemic.

III. Action taken by the rural district council and their sanitary officials in dealing with the epidemic and recommendations.

Addendum.—Water supply of Christchurch and the Southbourne district of Bournemouth.

I.—SANITARY CIRCUMSTANCES OF RINGWOOD.

It will be convenient to refer first to certain sanitary circumstances of the rural district of Ringwood, which are relevant to the inquiry. This district has an area of 36,447 acres and its population at the 1911 census was 7,153. It is situated in the south-west of Hampshire and is bounded on the north by Fordingbridge Rural District, on the east by the rural districts of New Forest and Lymington, on the south by Christchurch Rural District, and on the west by the county of Dorset.

The following figures relate to the district and are for the year 1912:—Rateable value, £38,250; assessable value, £33,948; total rates about 3*s.* 4*d.* in the pound. There is no outstanding debt chargeable to the district rate.

The town of Ringwood itself, together with certain adjacent areas, has a population approaching 3,000. It stands upon a gravel subsoil on the eastern side of the river Avon, about 13 or 14 miles from the river mouth at Christchurch. It is low-lying, being little above the level of the river, and, in consequence, the subsoil water is not far from the surface and is easily obtained for domestic use by means of the numerous shallow wells from which the water supply of the town is derived. There is an ironworks in Ringwood which employs about 100 men, and also a collar factory where a number of women are employed; with these exceptions the population is, for the most part, engaged in agricultural pursuits or the ordinary businesses of a

(26983—21.) Wt. 26659—369. 500. 12/12. D & S.

small country town. The surrounding district is entirely rural in character, comprising stretches of moorland interspersed with belts of coniferous trees.

Water Supply.—The town of Ringwood, as already stated, obtains its water supply from shallow wells; a few houses make use of water from Cockstone Stream, a fact which will be alluded to later in connection with the epidemic. The wells are generally situated in back yards or gardens close to the rear of houses. The water is generally found at a depth of 11 to 12 feet from the surface. The wells are round in shape and built of brick without cement or mortar so that soakage from the surrounding soil is bound to take place. The mouth of the well is, in many instances, below the level of the ground, being generally covered over with a flat stone or other unsuitable covering not calculated to prevent the entrance of surface water to the well. The water, in certain cases, is obtained by bucket and windlass, but more often by a hand pump. The pump is sometimes found in the scullery of the houses, and information as to the exact location of the well is difficult to obtain.

As a whole, the wells must be said to form very unsatisfactory and even dangerous sources of supply. Not only may the subsoil water on which they draw be polluted by neighbouring cesspools or drains, but in most cases the surface water which gets into them from the surroundings of the houses cannot fail to cause serious pollution of the well-water. It is indeed surprising that a place of the consequence of Ringwood has not long ago been provided with a suitable water supply of satisfactory quality.

Drainage.—There is no sewerage system in Ringwood, though there are a number of drains used to convey slop-waters from the houses and surface water from the roads, &c., to the river. The accompanying map shows the course of the chief drains and their points of discharge into the river. The main drainage outfall is at the south-eastern extremity of Bickerley Common not far from the railway line. There is also another outlet at the other end of the town near the brewery. The drainage is discharged in its crude condition into the river without treatment of any kind. I am unable to say, from personal inspection, whether these drains are in a satisfactory condition or not, but I was informed that many of them are jointed with clay and far from water-tight. I was likewise unable to obtain exact information as to the connections made with them and thus no adequate idea as to the composition or character of their contents could be arrived at. The town ditch, which runs at the back of the houses in Christchurch Street, is also shown on the map: it acts more or less in the capacity of an open drain.

Excrement disposal.—Pail closets are in almost universal use. Their construction is in many instances far from satisfactory and they are sometimes placed too near to dwelling houses. The contents of the pails are removed twice weekly by the district council. The pails are taken from the closets and emptied into a cart which goes round at night for the purpose. This cart is not properly covered, though some attempt seems to have been made by a local joiner to improvise a covering of wood. The

excrement is deposited on a farm some distance from the town where it is used on the land. There has been much complaint on the part of householders as to the manner of emptying these buckets. It is stated that they are not properly cleaned before return and that the proper bucket is not always returned to its owner. I was informed, on good authority, that privy buckets had been washed by the district council's men in Cockstone Stream on 1st August of the present year. I was also informed that the contents of buckets were, on at least one occasion, thrown direct into the river instead of being taken to the cart and removed in a proper manner. Complaint was made, while I was at Ringwood, that, on a certain night the cart had apparently become too full, with the result that excrement was spilled along Christchurch Road to the very natural disgust of the householders. The work is not adequately supervised.

It is estimated that there are about 30 water-closets in Ringwood. They are supplied by flushing cisterns, the water being pumped into a supply-cistern by a force-pump. The water-closet contents are said to be conveyed to cesspools, some of which are not water-tight. Certain cesspools are in too close proximity to wells; the inspector of nuisances informed me that in old property a distance of only 30 ft. sometimes intervenes between the two, though in the case of new buildings, built since the building bye-laws came into force, proper precautions have been observed. The water-tight cesspools are periodically emptied by their owners, their contents being spread on gardens or carted away. I was informed that certain householders are in the habit of emptying the contents of their cesspools into the town ditch which flows behind their gardens.

Disposal of house refuse.—The removal of house refuse is undertaken by the council in winter and contracted for in summer when the council's horse is required for drawing the cart which waters the streets.

House refuse is removed weekly and deposited in an old gravel pit about one mile from the town, an ordinary uncovered cart being used for the purpose. It is estimated that there are about 30 movable ash-bins of approved pattern. A great many old boxes, pails, tin baths, &c., are used instead of properly constructed receptacles.

There are few ash-pits and such as exist are seldom used now that public scavenging is adopted. There does not seem to be proper provision for the storage of horse-manure in connection with certain stables.

Sanitary administration.—The rural district council meets fortnightly on Mondays. A public health committee consisting of three members and the chairman of the council meets as often as is required.

The medical officer of health, Mr. Chas. E. Blackstone, M.R.C.S., L.R.C.P. Lond., who lives in Ringwood is in general practice in the district and is also medical officer to the Post Office. His salary as medical officer of health is £60, half of which is repaid through the county council. The inspector of

nuisances, Mr. H. D. Holloway, receives a salary of £50 as such (half of which is repaid through the county council), and £10 as building surveyor.

The clerk informed me that the inspector of nuisances is also supposed to act under the Housing (Inspection of District) Regulations, 1910, but was unable to show me any minute of the council to that effect. The inspector himself did not appear to be aware that he had any instructions in this matter.

II. Circumstances and Causation of the Epidemic.

The epidemic in this rural district was almost entirely confined to the town of Ringwood and the villages of Moortown and Kingston. There were, up to the time of my leaving Ringwood, 77 cases and 5 deaths.

According to the annual reports of the medical officer of health the number of cases of enteric fever notified in Ringwood Rural District during the past ten years has been as follows: —

Year	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.
No. of cases...	0	3	3	2	0	5	0	0	0	2

Up to 13th September 77 cases were notified in the present epidemic. There were 43 houses invaded. The number of cases in each house was as follows: —

1	house	had		7	cases;	total	7
1	,,	,,		5	,, ;	,,	5
2	houses	,,	each	4	,, ;	,,	8
5	,,	,,	,,	3	,, ;	,,	15
8	,,	,,	,,	2	,, ;	,,	16
26	,,	,,	,,	1	,, ;	,,	26
43							77

Table I.

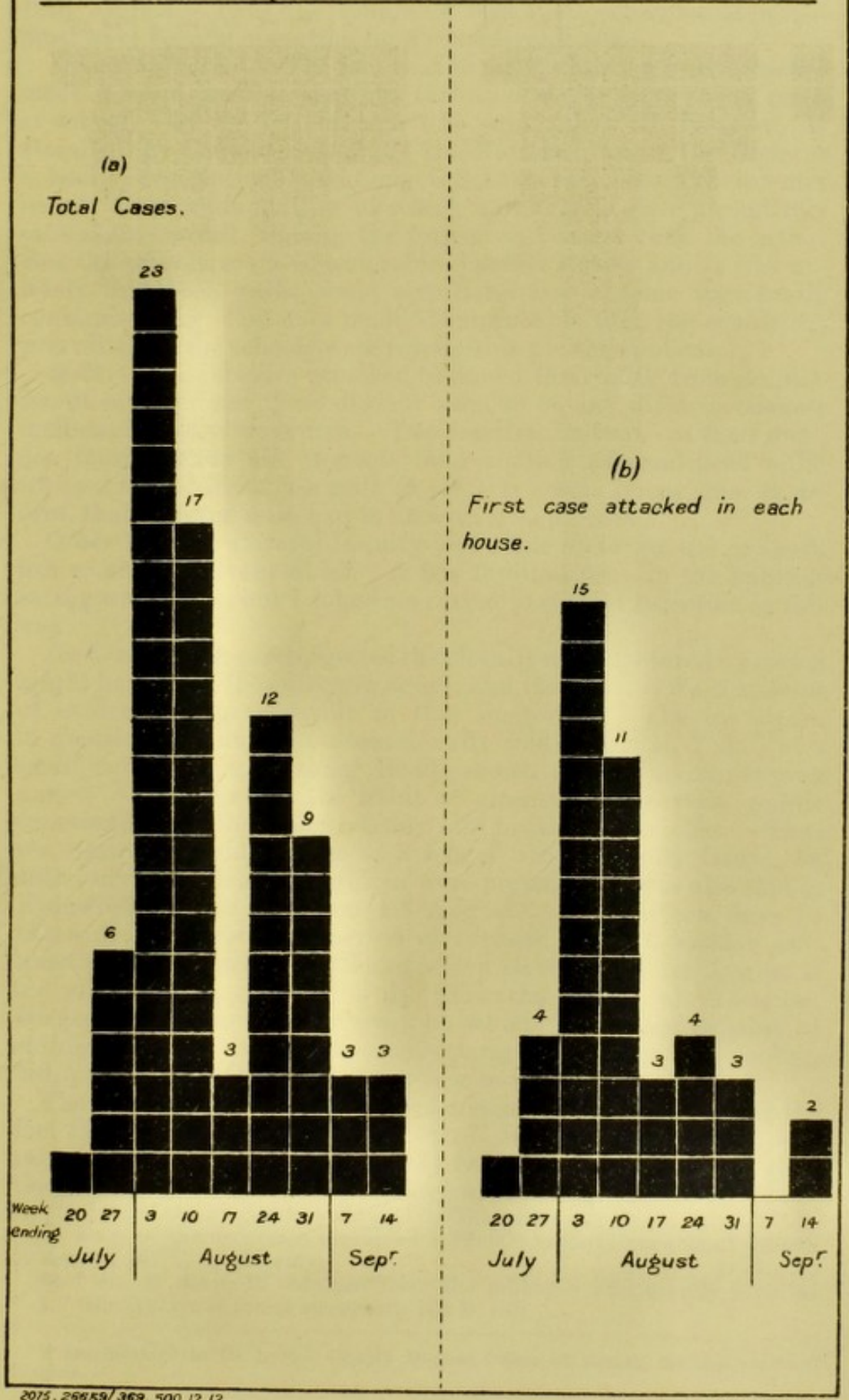
Age and Sex Distribution.

Age.	0—	5—	10—	15—	20—	25—	30—	35—	Over 40.	Total.	Percentage.
No. of males...	3	17	22	3	1	—	—	3	2	51	66·2
No. of females	2	8	10	1	—	—	2	3	—	26	33·8
Total ...	5	25	32	4	1	—	2	6	2	77	100

From Table I. it will be seen that the incidence of attack was very much greater on males than on females and on children and young adults rather than on those of older age. More than four-fifths of the cases were under 15 years of age, and the age group 10-14 suffered most. This age and sex distribution is of considerable importance in view of certain circumstances in connection with the epidemic to be considered later.

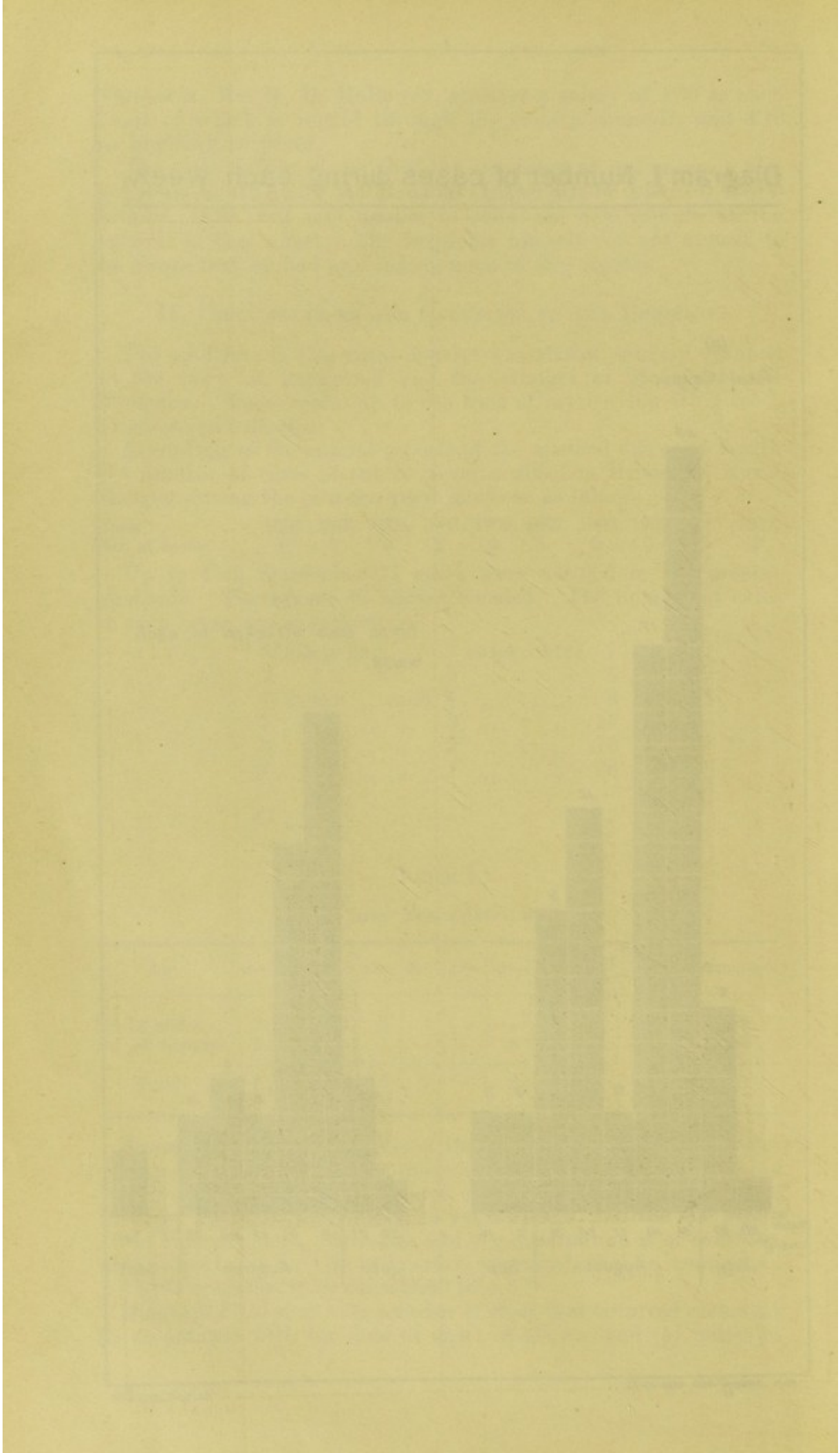
Diagram I. (*a*) shows the number of cases that occurred each week in accordance with the date of onset of illness, and (*b*) indicates

Diagram I. Number of cases during each week.



2015. 26659/369. 500.12.12

Malby & Sons, Lith.



the date of onset of illness of the first case in each of the 43 houses invaded. The epidemic, so far as dealt with in this report, commenced on 18th July and continued till 13th September—a large number of cases falling ill during the fortnight 28th July to 10th August. Thus the source of infection—whatever it was—must have been in operation for a considerable time.

School Infection.—The fact that so many children were attacked made it seem possible that the infection might have taken place at school. Of the 56 children who were taken ill, however, 31 attended the Council School, 24 the National, and 1 the Bisterne School. The National and Council Schools both obtain their water supply from wells neither of which on analysis gave an entirely satisfactory result, though the former was better than the latter. But the schools are a considerable distance apart, and it was unlikely that both wells would simultaneously become specifically contaminated. This fact made it improbable that the conditions prevailing at the schools were responsible for the epidemic.

Milk.—The families attacked obtained their milk from six different sources, and there did not seem to be any disproportionate incidence on any one source. Two families had cows of their own; one family made use of goats' and another of condensed milk, while a fifth did not use milk at all. It seems impossible, therefore, that infected milk had to do with the epidemic.

Other Foods.—Careful inquiry was made as to the use of shellfish or uncooked vegetables. A few families were in the habit of eating watercress, but I found no reason to suspect infection in this way.

Ice Cream.—It was suggested that locally manufactured ice cream might have been the infective agent, and there is a certain amount of evidence to give colour to this suggestion. The ice cream in question was made and occasionally sold by a man " A " at a small fish shop in Furlong Road, shown on the accompanying map. " A " was in the habit of attending at certain public functions where there was a ready sale for this commodity. Thus ice cream was sold by him at a school treat at Holly Grove, on 18th July, at which 447 children were present. It was also sold at Ringwood Flower Show on 1st August. If fourteen days be taken as the incubation period of typhoid fever, a sudden outburst of the disease might be expected on or about 1st August if ice cream eaten on 18th July were the source of infection. Diagram I. shows that the week on which the largest number of children fell ill was that commencing 28th July and ending 3rd August, so that this expectation is to some extent fulfilled.

The suspicion attached to the ice cream was strengthened by the fact that a sample taken from " A's " shop on August 14th and submitted to analysis at the County Laboratory, Winchester, gave the following results on bacteriological examination:—

*(1) 1 c.c of the ice cream contained 5,000 bacillus coli.

(2) 1 c.c. of the ice cream contained 1,380,000 bacteria capable of growth on agar at 37° C. in 48 hours.

(3) 1 c.c. of the milk obtained from the milkman who usually supplied " A " with milk was found to contain 100 B. coli.

---

* I am indebted to Dr. Lyster, County Medical Officer of Health, for the results of analysis.

(4) 1 c.c. of the above milk was found to contain 7,800 bacteria capable of growth on agar at 37° C. in 24 hours.

(5) The sediment from the milk gave the reactions for biliary acids thereby proving direct manurial contamination.

Thus whether the ice cream contained the B. typhosus or not, it at least appeared to have been open to fæcal contamination. It is doubtful as to where or how this contamination took place. I understand that the batch from which this sample was taken was not made for the purpose of sale, but rather to demonstrate the mode of manufacture. It is possible that it was exposed to dust or became contaminated in some other accidental manner.

I made careful inquiry from " A " as to the method of manufacture. I learned from him that the ice cream in question was made by himself, and that no one else had anything to do with it or came in any way in contact with it. It was made solely from milk, ice-cream powder, and sugar, and is prepared as follows:— The milk is first brought to the boil, then the requisite quantity of sugar is added and the mixture boiled again for a few minutes. This boiling milk is then poured over the ice-cream powder, the mixture, which forms a sort of custard, being thoroughly stirred all the time. It is then boiled for a few minutes and put into a special tin. This is done the last thing at night, the receptacle being covered with a lid and put into the passage to cool. Early next morning it is frozen in the usual way by immersion in a freezing machine, the freezing mixture being ice and salt. I was assured that no ice is put into the cream, but merely surrounds the vessel containing it.

I was unable to discover anything in the process of manufacture to which exception could be taken. The milk was derived from a source which supplied many other customers without ill effects. The utensils were said to be thoroughly cleansed and scalded with boiling water.

I was informed that " A " had been in the Navy from 1883 to 1895, and that he had been ill with what was probably enteric fever about the year 1891-92. It was therefore thought that he might be a carrier. Dr. Gott was good enough to obtain for me a specimen of his fæces, which was forwarded to the Lister Institute for bacteriological examination, but was returned as negative as regards bacillus typhosus. " A's " excretions are being regularly examined at the County Laboratory, Winchester, but the results have so far proved to be negative.

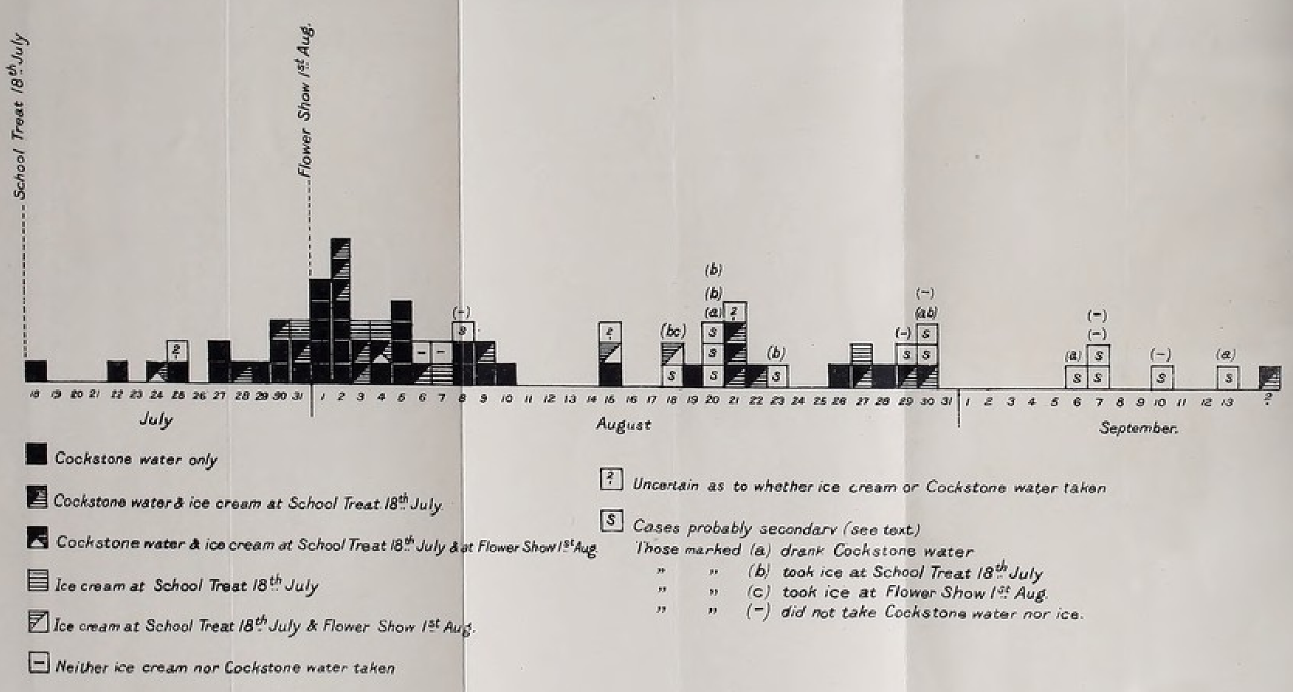
The functions attended by " A " during the present summer were as follows:—

July 4.—The Nag's Head (Slate Club), Christchurch Road, Ringwood.
,, 10.—Gussage All Saints, Cranborne, Dorset.
,, 18.—School Treat, Holly Grove, Ringwood.
,, 23.—Burley Village Festival, Burley, Ringwood.
August 1.—Ringwood Flower Show, Ringwood.
,, 5.—Burley Races, Burley.
,, 8.—Verwood Rechabites Fete, Verwood, Dorset.

It might reasonably be expected that if " A " were a carrier case and was the means of infecting ice cream on July 18th he would also have infected it on 23rd July, yet there have been no cases of enteric fever at Burley nor at any of the other places, with the exception of Ringwood, attended by him during the summer. Further, he has been in the habit of making ice cream off and on for the past seven years, and this is the first time that suspicion has been attached to it.

Diagram II. Dates of Onset of Illness and relation to Water & Ice.

Each Square represents one case.



The Wesleyan Sunday School treat was held at Holly Grove (in some fields near the Ringwood Workhouse) on 18th July. There were 447 children present—384 from the town of Ringwood, 36 from Kingston, and 27 from Crowe. It was found impossible to ascertain how many of the 447 children had eaten ice cream. It seemed desirable, however, as a sort of rough-and-ready test, to visit the schools and find out the number of children attending school who had been at the treat, and the number who had partaken of ice cream there. Unfortunately, at the time of my visit the attendance at the schools was very low owing to fear on the part of the parents that the children might contract enteric fever at school. From information which the head masters of the council and national schools were good enough to obtain for me, however, I learned that 168 of the children then present at school had attended the treat, and that 116 of them had eaten ice cream and had not been injuriously affected by it. As the ice cream supplied to the treat was all made at the same time, by the same person, and in the same way, it seems unlikely that, had it been infectious, at least 116 children and probably many more could have eaten it and escaped.

Besides the ice cream, cakes, bread and butter, fruit and tea were consumed at the treat. I was unable to discover, on careful inquiry, anything of a suspicious nature in connection with them. It is said that no uncooked water was drunk, and that all mineral waters were manufactured in Bournemouth or other places at a distance from Ringwood where there has been no prevalence of enteric fever.

Only five of the cases of enteric fever are known to have eaten ice cream at Ringwood Flower Show on 1st August. This show was held in some fields near the centre of the town. Forty-two children attending the council school were present at it, and 31 partook of ice cream without ill effects. Tea and cakes were provided by a baker in the town. Mineral waters—none of which were locally made—were also on sale.

Diagram II. shows the daily occurrence of cases arranged according to date of onset (so far as that could be ascertained) from 18th July to 13th September. It also shows, in a graphic form, the number of cases that partook of ice cream at the school treat on 18th July and at Ringwood Flower Show on 1st August, together with the number of secondary cases, &c. The cases shown as "secondary" are those where multiple cases occurred in the same house, the "secondary" ones fourteen days or longer after the primary case, and where the attendant circumstances seemed to point to the primary case as being the source of infection.

It will be seen that 32 of the total number of cases took ice at the school treat on 18th July; seventeen of these did not become ill until three weeks or longer after having eaten the ice, so that it is not likely that they were infected by it. This leaves fifteen who might have contracted the disease as a result of eating ice at the treat had it been infected. Five cases took ice at the Flower Show on 1st August, all of which had already taken it on 18th July. One of these was ill at the Flower Show, and could

not, therefore, have become infected there, though he might have been infected at the school treat on 18th July. One other is included among the fifteen who may have contracted the disease at the school treat. Of the remaining three one was probably secondary, as his brother, attacked on 24th July, was nursed at home, and was in all likelihood the source of infection. Thus two cases might have been due to eating ice on 1st August, and adding to these the 15 who ate ice on 18th July, we get a total of 17, or 22 per cent. of the total number of cases in which ice might have played a part had it been the infecting agent.

As already stated, if ice eaten on 18th July were the source of infection a sudden outburst of the disease might be expected fourteen days later, on or about the 1st and 2nd August. Diagram II. shows that twelve cases did, in fact, fall ill on those two days, but that only three of them had partaken of ice on 18th July.

From the accompanying map—which shows the area chiefly affected—it will be seen that the epidemic had a very definite distribution. The infected houses are nearly all situated in the south of the town on either side of the railway line. In the villages of Moortown and Kingston—also lying to the south—there were a considerable number of cases. As there were present at the school treat a very large number of children from all parts of the town many of whom partook of ice-cream, the cases would have been scattered here and there all over the town instead of being confined in groups to certain definite areas, had ice-cream been the infective agent.

Everything considered, it seems certain that ice-cream was not the essential factor common to all the cases reported; the contributory part played by it, if any, is doubtful for reasons which will appear later.

Water.—The water supply of Ringwood, as already stated, is derived almost entirely from shallow wells which are open to gross pollution, and this fact might at once have aroused suspicion that water was the infective agent had it not been for the very large proportion of children attacked. Water is used more or less indiscriminately at all ages, and therefore it was difficult to understand how it could, under the circumstances, be held responsible for the epidemic.

A few houses obtain the whole or part of their supply from a dipping-well formed by the hollowing out of part of the bed of a small stream which flows by the road-side in Cockstone Lane, and 29·9 per cent. of the total cases occurred in or near this lane. Fifteen cases over 15 years of age were taken ill during the epidemic, and of these 10 were supplied by Cockstone water; one by a well probably contaminated by Cockstone water, and the four remaining were secondary cases. Thus all the adult cases could have been infected directly or indirectly from Cockstone water if this had been the infective agent. There were a total of five deaths from typhoid fever, four of which were users of Cockstone water.


A to B Drain put in by County Council
Shop where Ice-cream was made
Drain Outlet
Town Ditch
MANSFIELD
KINGFIELD
National School
CEMETERY
RINGWOOD
BICKERLEY COMMON
L & S.W.R
HAMPTON & DORCHESTER
Station
Liable to Floods
Moortown
MAP OF
RINGWOOD,
Showing the Area chiefly affected
EPIDEMIC.
Red dots = Houses affected.
Red lines = Position of Sewers.

Table II.

Complete list of Houses supplied in whole or in part from Cockstone Stream.

Sole or Part Supply.	Address.	Number of Persons in each House.			No. of Cases.	Remarks.
		Adults.	Children.	Total.		
Part ...	Christchurch St.	2	2	4	3	
Sole ...	,,	2	—	2	—	Ages 65 and 70. Never drank cold water.
Sole ...	,,	2	2	4	1	
Sole ...	Cockstone Lane	2	6	8	7	
Part ...	,,	2	5	7	2	1 dead.
Part ...	,,	2	—	2	—	70 and 72 years old.
Part ...	,,	1	—	1	—	50 years old.
Part ...	,,	1	4	5	3	1 dead.
Sole ...	,,	2	4	6	4	1 dead.
Sole ...	,,	1	4	5	3	1 dead.
For cleaning	,,	2	—	2	—	52 and 53 years old.
				46	23	

The above table gives the number of houses that derive their water supply in whole or in part from Cockstone Stream and the number of inhabitants in each house. It also shows the number of cases per house along with other particulars. Of the 46 persons using this water no fewer than 23 or 50 per cent. contracted enteric fever. Of these 23, only six had, so far as could be ascertained, taken ice-cream. There is, therefore, very substantial grounds for believing that Cockstone water was the infective agent, at least in this locality. After this was ascertained, however, it was still difficult to understand how children in parts of Ringwood with a different water supply and in Moortown and Kingston could have become infected by Cockstone water. It is a matter of common knowledge, however, that children—especially from certain districts—were in the habit of lying down on the roadway and drinking at this stream on their way to and from school and at the luncheon hour. I therefore made very careful inquiry from the children attacked as to whether or not they were in the habit of drinking from Cockstone stream and tried, as far as possible, to get their answers corroborated by their parents or brothers and sisters. Doubtless such information is not entirely satisfactory and is open to considerable inaccuracy, as the childish memory is not always precise in matters of detail, yet upon the whole little doubt was left in my mind that Cockstone water was responsible for a very large number of the enteric fever cases.

Putting the results of my inquiries together, I found that 55 out of the 77 cases or 71·4 per cent. drank Cockstone water. Three are uncertain whether they drank it or not and 19 definitely

state that they did not do so. Of the 19 who did not drink Cockstone water, nine are secondary cases which were probably indirectly affected by Cockstone water as, in each instance, the first case to fall ill in the house drank Cockstone water; and there is reason to believe that three others—all of one family—may have been similarly infected as the first case in the house was that of a child known to be in the habit of playing in Cockstone Lane, though she is uncertain whether she drank the water or not. As regards the remaining ten, in one or two instances I was by no means satisfied with the value of the negative evidence. Disregarding all cases in which there is any doubt, however, investigation showed that all the 77 cases can be traced directly or indirectly to Cockstone water with the exception of three who are uncertain whether they drank it or not, and ten who say they did not.

That many more males than females should be attacked is also significant, as boys would be much more likely to lie down on the road and drink at the stream than girls, who would hesitate to do so lest their clothing should become soiled and in fact it was known that this was the case.

The distribution of the infected houses on the map points also to Cockstone water as being the infective agent. Those children who lived to the south of the town and who had to pass near to Cockstone Lane on their way to or from school were more likely to have drunk this water than those in the centre or north part of the town who are less often in its vicinity.

It is interesting to note that the ice-cream maker's brother, who lived in Cockstone Lane, served out ice at the school treat on 18th July. This man was attacked by enteric fever, but not until August 21st. His son was attacked previously, having become ill on July 28th: it is unlikely that he was in an infectious condition at the time of the school treat. On the other hand the first case which occurred during the epidemic became ill on 18th July, and resided in Cockstone Lane. It is possible, therefore, that if the ice-cream had anything to do with the epidemic, it may have become contaminated in some way from Cockstone Lane rather than from the shop where it was manufactured. This suggestion is strengthened by the fact that, while the wife and three children of the man who made the ice-cream escaped, the wife and five children of his brother in Cockstone Lane became infected.

If Cockstone water was the infective agent it was obviously important to try and discover how it became contaminated and for this purpose its course, which is shown on the accompanying map, was carefully traced from its source.

Cockstone Stream.—The stream has its commencement at a spring situated in a field lying between the cemetery (but separated from it by a small wedge-shaped field), and the houses in College Road which are at a higher level than the spring. It then passes in a pipe beneath a collar factory and under Quomp

Road and comes out into a waste piece of ground formerly used as a water-cress bed. This waste piece of ground seems to have been used for a considerable time as a convenient place of deposit for rubbish of all kinds—paper, road scrapings, tin cans, an old privy bucket, bones, rags and other filth being noted on the day of inspection. In this waste piece of ground it is joined by another small stream which seems to rise in a spring near the road-side and makes its way past the back of gardens (but at a lower level) through rubbish of all kinds till it joins the main stream. The united stream runs behind the gardens of the houses in Nursery Road and is polluted by garden manure, house refuse, ashes and other objectional matter. It next enters a builder's yard where it makes its way through disused paint pots, old boxes, old hair used for plaster, and rubbish of all descriptions. In a corner of a shed in this yard where old pipes, lead, &c., are stored there were evidences of recent defæcation within one yard of the stream. There is also a pail closet in close proximity to it, and the exhaust from a gas engine impinges on the water.

After leaving the builder's yard, the stream runs close to the rear of the houses in Station Road. Behind the Railway Hotel (situated in Station Road) there is an open midden containing horse-manure placed in an angle between two houses. It is not covered or paved and the drainage from it must inevitably get into the stream which is about four yards distant. After leaving the hotel premises the stream flows through gardens, whence soakings from garden-manure may find their way into it. At this point it probably also receives slop waters from the houses as it forms a sort of convenient uncovered drain passing close to the back-doors. The stream is piped beneath some houses and under Christchurch Street; it then runs as an open ditch along Cockstone Lane, part of its bed being hollowed out to serve as a dipping well at which the inhabitants of the adjoining houses draw their water. A few feet below this well the stream is joined by a drain which conveys the surface water from the station yard and other premises direct into the stream.

Looking for the source of specific pollution of Cockstone Stream was a matter of very great difficulty as there were so many possible sources from which contamination might have been derived. I was informed by a medical man that a man who lives in close proximity to the stream had suffered from persistent diarrhœa some weeks before the outbreak. This man's blood and fæces were obtained and submitted to bacteriological examination but with negative results. Suspicion also fell on a drain-pipe which had lately been repaired in the road adjoining the old water-cress beds through which Cockstone Stream passes. While the repairs were in progress the contents of this drain were pumped on to the water-cress beds and contaminated Cockstone Stream. The surveyor who carried out the work informed me, however, that the pumping took place between July 30th and August 2nd, too late to occasion any pollution which could be responsible for the bulk of the epidemic.

III.—Action of the District Council and their Officers with regard to the Epidemic.

Under the terms of the Board's General Order of December 13th, 1910, relating to the duties of medical officers of health, the occurrence of the epidemic at Ringwood should have been reported to the Board by the medical officer of health forthwith. The form of report in such cases naturally varies, but it is always expected to comprise some indication of the locality affected, the result of any preliminary inquiries into the cause of the outbreak, and any prominent features in the incidence on age and sex along with a short statement as to precautionary measures. No such report was received in this case from the medical officer of health for Ringwood,* and it became necessary, in view of the absence of any information, for the Board to send a letter to the clerk of the rural district council (on Tuesday, 27th August) requesting that the medical officer of health should prepare a report on the subject. As no communication was received from the medical officer of health or rural district council, a telegram was sent by the Board on Friday, 30th August, requesting that the medical officer of health should at once forward the report asked for. As no communication had been received from the rural district council on Saturday, 31st August, I was instructed to go to Ringwood at once to ascertain what was happening.

I visited Dr. Blackstone the same evening and then learned for the first time that the epidemic was one of considerable magnitude, about 60 cases having been notified. I was unable to obtain a list of the notified cases from him and very little other information save that it was conjectured that the epidemic might have been caused by the consumption of contaminated ice-cream, and that he had been in communication with Dr. Lyster, the medical officer of health of the county, in regard to the outbreak.

I returned to Ringwood on the following day (Sunday) and made out a list of the cases from the notifications in the possession of the medical officer of health. I learned that the rural district council had no isolation hospital but that a farm-house had been obtained and that 26 or 27 cases had been sent there on Tuesday, 27th August—25 days after the first case of the epidemic was notified and when 48 cases of enteric fever had occurred.

Accompanied by Dr. Blackstone I visited Hall's Farm where the cases were isolated. It consists of a disused farm house situated at a little distance from the town and fairly isolated from other dwellings. I found 26 cases isolated here. Three trained nurses were on duty and another had been sent for. Five Red Cross ladies had very kindly volunteered their services to help

---

* Dr. Blackstone subsequently explained that he considered that the figures for Ringwood Rural District entered on the postcards sent weekly from all districts in the country to the Board for the purpose of their weekly statistics of notified infectious diseases was a sufficient "report" within the meaning of their General Order. This interpretation has never, so far as I am aware, been adopted by other Medical Officers of Health, and a statement of the bare number of notified cases does not give the information necessary for the Board's purposes in the matter.

to nurse the sick. At the time of my visit it was not easy to realise that the building was intended for the isolation of infectious persons; it was thronged with patients' friends who sat beside the cases. One boy was sitting on his father's bed fondling his hand; another patient had been kissed by a visitor, and so forth. In front of the house a number of people were assembled, who apparently regarded a visit to the hospital as a pleasant means of spending Sunday afternoon. There is a water-closet in connection with the house which, I was informed, drains into a cesspool. It was used only by the staff, the patients' excreta being buried in the garden behind the house at a point about 50 yards distant from the well from which the water supply is derived. As there is a gravel subsoil in the neighbourhood and as the level of the water in the well would probably be considerably lowered by the needs of the hospital, there seemed distinct risk of contamination of the water, and I advised that all water, for whatever purpose used, should be boiled.

Before leaving Ringwood I called upon the inspector of nuisances, who gave me what little information was in his possession with regard to the epidemic.

The condition of affairs administratively was very unsatisfactory. The medical officer of health stated that he had made no personal inquiry, unless among the patients in his own practice, as to the cause of the epidemic. Although he stated that he believed it to be due to the consumption of ice-cream, he could not produce any definite data on which to base this opinion. The fact that Dr. Lyster (County Medical Officer of Health) had visited Ringwood to consult with Dr. Blackstone did not, of course, relieve the district medical officer of health of his responsibilities in regard to the outbreak.

Although nearly a month had elapsed since the commencement of the epidemic, and 62 cases had been notified, no data were available which would throw light on the cause of the epidemic. As already pointed out, isolation accommodation was not provided until twenty-five days after the first case was notified. Many of the cases were by this time so far advanced in their illness that removal from their homes was attended with considerable risk. It is probable that if means for isolation had been available at an earlier date there would not have been so many secondary cases as there were.

It will have been gathered that the arrangements at Hall's Farm were in some respects unsatisfactory. The admission of patients' friends in the wholesale manner described was attended with considerable risk. While great praise is due to the Red Cross ladies who generously volunteered their help in a time of need, it must be remembered that in typhoid fever perhaps more than any other disease skilled nursing is indispensable for the welfare of the patients and those that attend upon them, and except in emergencies only fully trained and qualified nurses should be employed. At the time of my visit no one had been appointed as matron at Hall's Farm to be responsible for the general welfare of the patients and the carrying out of the doctors' orders.

On reporting the existing state of matters to the Board, I received instructions to make a detailed inquiry into the circumstances of the outbreak, and for this purpose returned to Ringwood, on Tuesday, 3rd September.

As soon as I became sufficiently acquainted with local conditions, I made certain suggestions to the Ringwood Rural District Council as to the steps which it seemed desirable to take to guard against the further spread of the disease.

At this time 42 cases were in their own homes and I was informed that two nurses—one appointed by the district council, and the district nurse—were available for looking after them. One nurse was wholly employed on night duty with five cases in one house. The other nurse was supposed to supervise the remaining 37 cases, many of whom were housed under very unsatisfactory conditions. The medical officer of health informed me of instances of sick and healthy people sleeping in one bed. I found it difficult to persuade him that more nurses were required to assist the patients whom it had been found impossible to remove to hospital. Typhoid fever cannot, with safety to the patient or to others, be nursed in a private house without the assistance of trained nurses; the risk is intensified in a small working-class house where the mother has other children and a husband to look after, as well as the patient, who, during certain stages of his illness, requires her constant attention day and night.

Towards the end of August a leaflet had been distributed among householders by the district council advising them to boil their water and scald their milk. This was good as far as it went, but it should have been followed by house-to-house visits to see that the advice was carried out, as experience proves that people are prone to disregard such advice unless the full danger is brought home to them.

A certain number of receptacles for the discharges of patients were provided by the district council for use at houses where the disease was being treated at home. Such receptacles were, I was informed, emptied daily with suitable precautions and disinfected by the council's men, the excreta being buried in the garden at Hall's Farm, together with that from the patients in hospital. This was of great importance, and when receptacles for all the invaded houses were obtained it put this very necessary part of the council's duty on a satisfactory footing.

A Doecker hut was lent to the rural district council by the Corporation of Bournemouth, and this was erected in the vicinity of Hall's Farm, making it possible for more cases to be accommodated there and to receive the advantages of hospital treatment. Gradually administration at the hospital and the arrangements to cope with the epidemic generally began to assume a rather more satisfactory aspect, and the next matter of importance was to try and discover the cause of the epidemic. As the information in the possession of the public health officials was so meagre, I found it essential to begin at the beginning and make a house-to-house visitation of the invaded homes in order to collect the facts in regard to each case. It was somewhat late to begin such

an inquiry, and though the people everywhere did their best to help, it is probable that accurate information was sometimes lacking which could readily have been obtained if sought when the dates and circumstances of the patients' illness were still fresh on the memory.

From interviews which I had with certain members of the district council, and from the reports of their meetings, it must be admitted that they were slow and indeed reluctant to realise the gravity of the outbreak, and it may be doubted whether, even at its termination, they have fully appreciated the importance of applying the lessons to be learned from it so as to prevent any similar recurrence. It was satisfactory to find, however, that many of the inhabitants of Ringwood were by no means content with the position of affairs, and by ratepayers' meetings and in other ways steps were taken before I left the district to promote reforms in the sanitary condition and administration of the place. Among these, in my view, the following are the most important:—

(*a*) A pure and wholesome water supply for the town of Ringwood; the district council should obtain expert advice with regard to this matter without delay.

(*b*) In view of the part which there are reasonable grounds for concluding that Cockstone Stream played in the epidemic, this stream ought to be protected from contamination in its entire course through the town.

(*c*) All practicable steps should be taken to prevent pollution of the River Avon at the present outfalls, and expert advice on this matter should be obtained.

(*d*) The district council should place the collecting and emptying of privy buckets upon a proper basis and see that the work is systematically supervised. Attention should be directed to the construction of privies, the provision of an adequate supply of dry earth for the pails, and to the arrangements for cleaning the pails.

(*e*) Suitable provision should be made and kept in readiness for the isolation of cases of infectious disease in the rural district.

(*f*) The defects of administration indicated in the report should receive careful and considered attention from those responsible for public health administration in the district.

In concluding the report, I would like to take the opportunity of expressing my indebtedness to the medical men in practice in the district and to all those who in their official capacity or otherwise were good enough to assist me in various ways in obtaining information in regard to the epidemic.

HUGH A. MACEWEN.

Addendum.

Precautions taken in regard to the water supply of Christchurch Urban and Rural Districts and Southbourne District of Bournemouth.

The Christchurch Urban and Rural Districts and the Southbourne District of Bournemouth are supplied by the West Hants Water Company with water taken from the River Avon below the town of Ringwood. The possible contamination of the water naturally gave rise to anxiety on the part of the local authorities concerned when the fact of the epidemic at Ringwood became known and was the subject of special consideration on the part of the medical officers of health of Bournemouth and Christchurch Urban and Rural Districts.

On Thursday, 5th September, I visited Christchurch and had an interview with Dr. Legate (medical officer of health for Christchurch Urban and Rural Districts), and also with the clerk to the urban district council. Accompanied by Dr. Legate, I visited the West Hants Water Works. This company obtains water from the Avon about 12 miles below the point where the slop waters, &c., of Ringwood are discharged into the river (*see* accompanying map). The water is subjected to sand filtration, there being nine large filters and four smaller ones, but there is very little storage accommodation.

At an interview which I had with Mr. King (Chairman, West Hants Water Co.) on the 5th September and at a subsequent interview between the medical officer of health and town clerk of Bournemouth, and the secretary, chairman and another director of the West Hants Water Company on 6th September, at which I was present, it was arranged that the Southbourne District of Bournemouth (which is supplied under normal circumstances by the West Hants Water Co.) should be supplied by the Bournemouth Gas and Water Co. under an agreement between the companies and the corporation. It was further agreed that the water supplied to Christchurch by the West Hants Water Co., would be treated by "chloros" as a temporary measure. A temporary plant for the chlorination of the water was erected without loss of time.

Credit is due to the local authorities concerned, their medical officers of health and the water companies for the very prompt action taken by them in the matter.

H. A. M.