M.D. Thesis

Epidemic of Diphtheria in the Withamore Fen of Lincolnshire during the years 1893, 94.

J. F. Carruthers.
M.B. C.M. 1842.
Preliminary.

I purpose in this Thesis to give an account of an outbreak of Diphtheria which occurred in the Wildmore Fire District of North Carolina during the years 1893 and 1894. I shall consider it under the following heads:

2. General Notes on
   a. Climate:
   b. Nature of Soil:
   c. Water Supply:
   d. Drainage + Sanitation:
   e. Personal habits, etc., of inhabitants.
4. Points raised by the epidemic as to:
   a. Throat:
   b. Course of individual attacks:
   c. Mortality:
   d. Incubation:
   e. Quarantine:
   f. Treatment.
I. **General History of the Outbreak.**

Following a dry spring and a hot and dry summer, the month of August showed a record heat-temperature. At the very end of August what was practically the first rain for months fell, and on the 14th of September occurred the first case of diphtheria.

There had been no diphtheria in the Wildmore Fen for fully fifteen years. During the summer there had been warnings that the health of the community was getting below par. The heat and the bad water had produced many cases of diarrhoea, and complaints of sore throat had been rife all the harvest. An epidemic of scarlet fever had closed the school in 1891/92 but when the school re-opened after the Harvest holidays on the 18th of September — although one case of diphtheria had already occurred — no one anticipated trouble.

On the 14th September, 1892

1. **MR. MIDDLETON, 25, Sandy Bank.**

was the first actual case. She was a young married woman, living alone with her husband in a "detached" house on the Boston road, with no children nor servant to carry infection in or out of the house. The case was notified, isolated, and proved not a very severe one. She was visited on by her husband's sister, while husband was kept away from work. On her recovery the house was only disinfected by the M.O.H.

Twenty days later, my late partner Dr. Herbert
Ashdown, was called into three homes to see children who had been sent home ill from school by the medical officer of the Board of School at Hanble House:

On the 24th September

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Address</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Edith Atkinson</td>
<td>Revery Fin</td>
<td>2.8.14.48.49</td>
</tr>
<tr>
<td>3</td>
<td>Hadley Harrison</td>
<td>Coppinsyle Lane</td>
<td>3.10.48</td>
</tr>
<tr>
<td>4</td>
<td>William Brown</td>
<td>Hindlehouse Lane</td>
<td>4.10.29.30</td>
</tr>
<tr>
<td>5</td>
<td>Louisa Brown</td>
<td></td>
<td>4.10.29.30</td>
</tr>
</tbody>
</table>

The school had reopened on the 28th September after 6 weeks' holiday. The first school case was notified on the 26th, the school closed again on the 27th. Once the disease appeared, cases followed one another rapidly. There were six cases:

On the 25th September

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Address</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Mary Ellen Taylor</td>
<td>Old Fin Lane</td>
<td>3.2</td>
</tr>
</tbody>
</table>

a child, about 1½ miles away from any of the earlier cases, but attended the same school.

On the 26th September

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Address</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>William Woodcock</td>
<td>Havenbank</td>
<td>7.10.46</td>
</tr>
<tr>
<td>8</td>
<td>Mary Atkinson</td>
<td>Revery Fin</td>
<td>2.8.14.48.49</td>
</tr>
<tr>
<td>9</td>
<td>Kate Emma Johnson</td>
<td>Coppinsyle Lane</td>
<td>9.10.26.36.36.36.39</td>
</tr>
</tbody>
</table>

These were all school cases.

On the 27th September

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Address</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>H W Harrison</td>
<td>Coppinsyle Lane</td>
<td>3.10.45</td>
</tr>
<tr>
<td>11</td>
<td>Florence Martin</td>
<td>Havenbank</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>William Kent</td>
<td>Foxhall</td>
<td>12.13.20.21.22.50</td>
</tr>
<tr>
<td>13</td>
<td>Florence Kent</td>
<td></td>
<td>12.13.20.21.22.50</td>
</tr>
<tr>
<td>14</td>
<td>Lucy Atkinson</td>
<td>Revery Fin</td>
<td>2.8.14.48.49</td>
</tr>
<tr>
<td>15</td>
<td>Mary Jane Johnson</td>
<td>Hindlehouse Lane</td>
<td>9.15.25.36.36.39</td>
</tr>
</tbody>
</table>

Of these five were school cases. One (10) returned to 0 (0) home die.

- 8 died.
living in a house previously infected from school.

**On the 28th September**

16. Herbert Woodcock 9 Havenbank [7.16.17.46]
17. Mrs Woodcock 46 — [7.16.17.46]
18. George Greenfield 7 Bankers Hill [18.27.38.58]

Two of these were school cases; No. 17 was the mother of children attending the school. The school was now closed again.

**On the 29th September**

19. Fanny Farmery 7 Applewhite Lane [19.31.35.57]
21. Mrs Kent 44 — [12.13.20.21.22.50]
23. Lizzie Otter 7 Sandybarn
24. Fanny Hillyett 5 Langrick [24.32.34]

Of these four were school cases; Nos. 20 and 21 were from the parents of school children.

**On the 30th September**

25. Charles R. Johnson 45 Greenhall Lane [9.15.25.36.36.39]
26. Alice Johnson 13 — [9.15.25.36.36.39]
27. Mary Greenfield 8 Bankers Hill [18.37.38.50]
28. Kate Beecham 6 Beecham Lane [47]
29. Harry Lishman 13 Woodside Lane [4.5.59.30]
30. Edward Lishman 8 — [4.5.59.30]
31. Agnes Farmery 7 Applewhite Lane [19.31.35.57]

On this day the number of fresh cases reached its maximum — 7 — which was made up of five school children; one girl of 13 not attending school but whose brother 8 years were and one adult.

1 died
On the 1st October

31. Mr. Arkin 60 Old Farm Lane [6.32]
32. Mary Hepworth 7 Langrick [24.33 34]
33. Lizzie Hepworth 10 [24.33 34]

Two school children, the grandparents of a schoolgirl.

On the 2nd October

35. Kate Turner 8 Appleby Lane [19.31 35 57]
36. Rose Johnson 10 Lingham Lane [9.15 25 36 39]
37. Fred Atkinson 6 Persley Lane [2.8.14 37 48 49]
38. Robert Greenfield 11 Burden Hill [15.27 38 57]

Three school children and one infant - all occurring in previously infected households.

On the 4th October

40. William Beecham 10 Highham Lane [28.40]
41. Ada L. Shorten 9 -

Three cases, one a schoolgirl in a previously attacked house. No. 40, the father of a large family attending the school, not one of whom however ever developed the disease. No. 41, a schoolgirl, one of a large family who all escaped except her.

On the 6th October

42. Harriet Nixon 7 Havenbank [43.43]
43. Lucy Ann Nixon 7 [43.43]
44. Dr. H. Ashdown 33 Coringsby

Two fresh school cases, sister. Dr. Ashdown was believed to have contracted the disease from a child who coughed over his face as he was seen.

x died
ing its threat. In his case the disease assumed a malignant form from the first, unfortunately this epidemic occurred in pre-antibiotic days. He was attended at his own wish by his great personal friend, W.J. Pilcher, F.R.C.S. of Boston, whose directions were carried out by Dr. Ashdown's locum tenens, Mr. A. F. Hector, myself. But all was of no avail. He died of cardiac failure on the 6th day of his illness, to the great sorrow of all who knew him. This great loss of scientific medicine. He was only 33 years of age.

There was now a break of three days:

**On the 12th October**

45. Ernest Harrison - 9. Coffinhowe Lane [3.10.45]
   A fresh case in a previously infected house.

**On the 13th October**

46. William Woodcock - 43. Havenbank [7.10.46]
   A fresh case in a previously infected house.

**On the 17th October**

47. Reuben Cox - 53. Bunker's Hill
49. William Atkinson - 8
40. Fred Greenfield - 2. Bunker's Hill [19.2.38.50]
   Three of these occurred in previously infected houses.

**On the 18th October**

51. Thomas Farmery - 16. Coffinhowe Lane [19.31.35.57]
   A fresh case in a previously infected house.

At this point the epidemic seemed to come

* died
to a halt, and no fresh cases appeared in Woodmore until the 9th of November, a break of no less than 22 days. Indeed it is possible that had the people observed the isolation which was recommended to them, there might have been no more cases. But the annual School Feast of the Wesleyan Sunday Schools was due, was unfortunately considered by the local Chapel authorities too important to be put off: the children flocked together into the village of New York from all over the firm, that side by side in a Concert and a Tea, with the result that a fatal re-infection took place, as will be detailed.

At the same time, probably from the same cause, outbreaks occurred in Tatterhall and Corringby, villages in such close association daily contacts with the infected firm district that I have treated them as one with it for the purposes of this essay.

**On the 3rd November**

52 Alice Flowers - 3. Tatterhall

This was the first Tatterhall case, and occurred in perhaps the most insanitary house in the village.

**On the 6th November**

53 Gertrude Short - 12. Tatterhall

This second case occurred - as a strange contrast - in the best house in the village, the daughter of the Guardian of the parish.

**On the 9th November**

54 Ruth Blake - 9. Tatterhall

Daughter of the Publican at the "Black Horse".

x. died
A batch of fresh cases now broke out simultaneously in Cuningsby and Wiltmore. The Cuningsby cases, with one exception (No. 74), were confined to one block of houses in High Street, which lie right behind the house in which Dr. Ashdon lived. They are separated from it by the breadth of one field, through which the drainage runs from Dr. Ashdon's house directly towards the wells which supply the aforementioned block. The exception (No. 74) lived in an insanitary block of houses farther on, separated from the rest of the cases by a considerable distance of fields and houses.

On the 6th November

856 George Blackburn - 3. Cuningsby [55. 56. 57. 58]

On the 7th November

56 Gilbert Blackburn - 8. Cuningsby [55. 56. 57. 58]

57 Horace Blackburn - 8. Cuningsby [55. 56. 57. 58]

On the 9th November

88 Rev. Blackburn - 47. Cuningsby [55. 56. 57. 58]

59 Martha Moore - 9. New York [59. 62. 65]

This latter was the first case in Wiltmore after the interval, and was the first due to the School Feast.

On the 11th November


861 Ernest Winter - 8. Haventown Mill [61. 64. 67]

On the 13th November

62 Mrs. McTaffy - 45. New York [59. 62. 65]

63 Mary Ann Horton - 13. Cuningsby now [63. 68]

The latter was a girl who came with her sister.

X. died
No. 68, from Leeds on a visit to her cousins near
Coombs by. Both girls attended the New York school
Feast, both contracted diphtheria, both died.

On the 20th November

64 Herbert Winten 9 Havenbank Mill [61.64.67]
65 Mrs. Moore 29 New York [87.62.65]
The former a fourth case in a previously infected
house; the latter caught it from her daughter,
No. 69, whom she was nursing.

On the 22nd November

66 Rose Stampfer 11 Comingsby

On the 23rd November

67 Julia Winten 1 Havenbank Mill [61.64.67]
68 Ellen Horton 9 Comingsby [63.68]
Both in previously infected house.

On the 26th November

69 James Hodgson 18 Uphamyle Lane

This was a young man who lived with his father
and mother in a house quite apart from any
infected house. He worked on his father's land, so
had not been near any infected house or person;
so far as he or any member of the household could
ascertain.

On the 7th December

70 William Wilson 45 New York

A big powerful blacksmith, with room in his house
for half a dozen diphtheries. His case was far
hares his most favourable. I had.

x. died.
On the 23rd December

The most severe case I had which recovered.

On the 19th January

72. William Watson, jun. 20. Coningsby. [72.75.76.77.78]
The son of the Coningsby Miller. Their house is in the infected block. This lad + the waggoner (the father of No. 76.77.78) both the floor east all about the farm, calling at almost all the infected houses there. Miss East, No. 75, was housekeeper to the Watsons.

On the 20th January

Another curiously isolated case, lying as much in Pattenshall as in Coningsby.

On the 25th January

An isolated case in Providence Place.

On the 26th January

75. Sarah Ann East. 26. Coningsby. [72.75.76.77.78]

On the 25th February

76. Fred Morley. 7. Coningsby

On the 15th February

77. Frank Morley. 4. Coningsby

On the 20th February

78. Harry Morley. 3. Coningsby

These last three were children of the Miller's Waggoner, and lived in a cottage in the milk yard. Close to heghills, stables, middens. After the epidemic died.
was over, the M.O. U. ordered the removal of such accompaniments as were closest to the Morley's house, but it was never done. The surroundings are still thoroughly insanitary.

On the 29th March

79. Mary L. Wells – 14. Tattershall

There now ensued a long break in the epidemic. No further case occurred for about three months, during this time all the infected houses and the school were thoroughly disinfected by the M.O. U.

Nevertheless, on the 3rd June, 1894, after an interval of 70 days, the disease appeared again, again the Tindalmore School was the evident focus of contagion. The first victim on this occasion was a new resident scholar, Miss Kent, whose brother, sister, father, and mother all suffered in the 1893 outbreak. At that time she was living away in Bournemouth. Simultaneously with Miss Kent, Albert Biggarlie, No. 71, one of the boys at school fell ill. This case was followed by two of his brothers. This, however, was all the 1894 outbreak.

It is worth of note that during all this time the resident Schoolmaster's family, none of whom attended the school as regular scholar, entirely escaped the disease.

Exactly one year later, the very day, the 2nd of June, 1895, one more case occurred in New York, No. 84, Lizzie Trafford – but it went no further.
1894
June 7 - Emily Kent 20 - Prokhan [12.13.20.21.22.20]

1895
June 7 - Léonie Trafford 15 - New York

The epidemic continued nearly 2 years. Breaking out in September 1893 it rapidly spread, 57 cases appearing by the 18th October with a mortality of 19 = 37.25%. After a slight pause it reappeared, +28 cases occurred up to 19th June, 1994: of which 15 died = 53.57%.

There was now a 70 days' break: then in June, July and August 1894 there were 42 cases, 22 deaths = 52%.

Lastly, a year later, in June 1895, there was one case (which I was unable to treat with antitoxin) which recovered. Since that date there has been no re-appearance of the disease.

Total of Cases .. 84
Total of Deaths .. 36
Mortality ... 42.85%
II. General Notes.

a. Climate.

I should describe the climate of the Fens as neither bracing nor relaxing. It is distinctly a heavy air, which on strangers has at first a downy and sleepy effect. It is a flattening country; men and animals both incline to put on fat in it. There is said to be a notable absence of extremes over the year.

Rainfall.

averages about 24 inches.

Temperature

Mean for the whole year 46.70° F.
- July, the hottest month 62.8° F.
- January, the coldest 36.5° F.

The population of the county for extreme cold depends on the large expanses of shallow water (Evelst Marsh, etc., others) which become available for skating after one or two nights' sharp frost. Knebworth House is not really colder than other parts of England.

Thunderstorms.

Very frequent, often dangerous to life and property.

Climatology.

The perfect system of drainage has removed completely the old characteristics of the Fens. There are still occasional fogs, but not nowadays more than elsewhere. Indeed, for clearness of air and beauty of skylines the Fens cannot easily be matched. With the Marshes have disappeared most of the old
characteristic Fauna, the Butterms, Puffs, *Reeves*,
Bustards, Herons, Cranes, & Swans.

Owing to the Fens having been enclosed only
during this century, the trees in Wildmore are both
few and small. The kindle sweeps the country side
very nearly. But the traveller finds it nowadays
quite impossible to tell when he has passed over
the boundary that entered the Fen proper. I may
quote from Drayton's Polyolbion his description
of South Lincolnshire — to show what it is not —

"Thus of her foggy fens to hear rude Holland brate,
  "That with her fish & fowle here kepeth such a coyle,
  "As her unwholesome air and more unwholesome soyle."

Health and characteristic Diseases.
The general health is better than outsiders expect, but
certain maladies may, in my opinion, be considered
as peculiarly prevalent in or characteristic of the Fens.

1. Ague.
The Fen Ague is extinct as the Duke. Only the oldest
inhabitants have suffered from it: to the living, and
living generations it is merely a phrase. The theory
that the mosquito is necessary as an auxiliary host for
the spread of malarial fever is well borne out in the
Fens; mosquitoes are very common and exceedingly large.
There can be no question that the source of malarial
Fever lies in the sun acting on decomposing vegeta-
tion, alternately covered and uncovered by the water.
There are still in the Fites plenty of mosquitoes, but no doubt plenty of Plasmodia — but the accompanying vegetation is gone, with it. The Ague. During the seven years I spent in the Fites, it was a matter of common observation that a violent out-break of Ague ruined the bringing up of new soil into cultivation.

The account of the natives of the Fites show that Ague was specially prevalent at that time, but as the decaying organic matter disappeared, all cultivation ague ceased to be a fear.

It is worth noting that the Opium habit has been as prevalent among the Fites as it still is in the malarious districts of Northern India. The value of Opium as an anti-malarial agent, or as a stimulant, was discovered before the days of Bartky, and the habit continues here through the original cause of it — has long since disappeared. The habit is very largely on the decrease. The local Chemist in Corningly tells me that he now sells less than a third of what he did twenty years ago, and a fraction of what his father did before him. Still even now, all the grocers in Fitesland keep Opium: when a bottle & a kipience are silently placed on the counter, the shopman asks no question as to what is wanted.

It can seems to be attended with much less harm than spirit-drinking. I have been in my care men and women who have been taking Opium for over quarters of a century, and cannot say that I have observed much ill effects therefrom.
II. Anaemia.

Anaemia may be described as practically universal in the Fens among girls between 15-21. It is really rare to find one completely except, of course, that between these ages nearly four out of every ten girls pass through the doctor's hands for a time. Early menstruation is also the rule. I have noted several cases at 10 years of age; while from 11 to 13 is the usual age. It becomes a rarity to hear of a commencement of menstruation over 15. The influence of this upon anaemia is obvious but undeniable. During a five years' residence in the Fens, I cannot recall five "rosy-cheeked maids." They are all pallid and listless, but well-built and pretty featured.

The same remarks as to sallowness apply to the boys, though naturally to a lesser degree: it cannot but be that the want of colour is connected with the flatness of the land, the absence of "flying," and the absence of the "up-borne malaria.

III. Rheumatism.

It is not more common than elsewhere in England.

IV. Enlarged Tonsils.

This is one of the most characteristic features of the Fen Constitution. So much was this due during the epidemic of phthisis with the apparently general hypertrophy of the Tonsils, in the thrombocytopenic healthy members of the families as well as the...
unhealthy — that on the 23rd February, 1877, when there was more than average freedom from sickness in the district, that all the children at the Millmore Board School at Huddersfield passed before me, and found the following:

\[
\begin{align*}
\text{56 Girls} & \\
\{ & \\
\text{Tonsils enlarged} & \ldots 37 \text{ } 66\% \\
\text{Tonsils not enlarged} & \ldots 19 \text{ } 34\% \\
\text{49 Boys} & \\
\{ & \\
\text{Tonsils enlarged} & \ldots 32 \text{ } 65\% \\
\text{Tonsils not enlarged} & \ldots 17 \text{ } 35\% \\
\end{align*}
\]

I cannot imagine that such a state of things is usual in other places, but cannot find statistics anywhere. In any case this condition must have rendered these children especially receptive to the diphtheritic poison. I submit the following figures as bearing upon the theory — in my experience a thoroughly sound one — that diphtheria is essentially a disease of an already unhealthy throat:

<table>
<thead>
<tr>
<th></th>
<th>Percentage of Diphtherial Tonsils found among School children</th>
<th>Percentage of Mortality during the whole epidemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 years or under</td>
<td>106 out of 71 = 71.83%</td>
<td>26 out of 49 = 53.06%</td>
</tr>
<tr>
<td>Over 10 years</td>
<td>83 - 34 = 52.73%</td>
<td>10 - 35 = 28.07%</td>
</tr>
<tr>
<td></td>
<td>69 - 105 = 65.71%</td>
<td>36 - 84 = 42.05%</td>
</tr>
</tbody>
</table>
V. Bronchial Asthma.

I have noted four cases which seem to me a curious mixture of bronchitis and asthma. They have the sudden onset of asthma, in dyspnea, in absence of fever, & in comparatively short duration: but they then at the same time a severe paradoxical cough, & after a period varying from an hour to two to three or two, a free expectoration of bronchitic phlegm.

Ordinary Asthma "cures" have little to very slight or no good effect at all. I have found it best to attack the complaint with full doses of Belladonna + Stramonium: with dose of Potash after the worst of the attack is over.

VI. Cancer.

Llandowshire is one of the county's markers deep blue in the Cancer maps of England. My experience in the Fens fully bears this out. I once signed five consecutive death certificates for Carcinoma.

3. Nature of Soil:

The reclamation of these Fens is one of the most interesting chapters in the physical & geographical history of England. Its bearing upon the hygienic conditions in which the sufferers from the epidemic's bite, is so marked that I propose to describe briefly the formation & influence of the Wildmore Fen.
The William Pines, which have Lincoln at the apex, and Trafflefleet Boston, Spalding on the base line of the rough triangle that form, are intersected by the River Witham, this 'foss' or 'moor' of the whole country from Lincoln to Boston, and from Trafflefleet to Spalding. In old days it was navigable for large vessels as far as Lincoln but sometimes its banks that floods constantly overflowed the upper parts of the level, and the tides daily covered the lower.

This was the condition of things which the Romans found, which they at once set to work to overcome by constructing banks to keep out the tidal waters. The magnitude of their works strikes me with amazement. It was only after their construction that the towns of Boston, Spalding, Wisbech came into existence. Their sea-banks are many miles in length, of enormous size; and are in actual use at the present day after nearly 19 centuries of work. In 1870 a breach was made in the Roman sea-wall by combined high tides and strong winds, and the land was submerged from Trafflefleet to Spalding, the waters rising to the furnal in Boston Church. The Romans also cut the great Car Dyke Drain from the Witham to the Welland, to cut off the upland waters from flooding the low lands, which purpose it still serves.

After their departure the inland banks and sluices were neglected, and were then again attended to by Norman times. This neglect has had a direct
barring on the formation of the Wildmore Fen.

The Bocks, constructed to keep out the tidal waters, had a tendency to check the current of the
highland waters, causing an increased deposit of silt and a gradual raising of the river bed. When the banks
and sluices were neglected as they breached the
banks, again flowed over the Fens depositing
silt and sand wherever it went. Their incoming
tide met the highland waters which, carrying
down soil from the higher lands, bordering on the
Fens, also deposited their sediment wherever they
went. Thus, attacked both by river and sea, the
level of the Fens gradually rose to the present height.

Then the Norman Conquest brought civilization
and cultivation into the land again. The higher parts
naturally received first attention. They consisted
of fertile, dry land, growing good timber and crops,
ever interfered with by tides only occasionally
temporarily by floods. The lower parts however
remained until about 130 years ago in a state
little better than a vast moor covered day by
daylight flooding tide, producing sedge, reeds,
alder, willows, the decay and decomposition of
which have formed the great peat deposits of Kyley
Deeping, the East Fen. It is from the deepest
and worst portion of these lower parts that the
land Wildmore Fen of today has been reclaimed.

As land became more valuable for agricultural
purposes, works began to be undertaken
for the reclamation of these lower parts. These works extended from the time of Elizabeth down to 1767. In the time of Charles I., a considerable part of the Holland Fens was drained by private adventure, but the unsettled state of public affairs prevented proper protection and resewage, and land became again what Macauley describes it to be:

"a vast and desolate fen — a dreary region covered by vast flanks of wild fowl, inhabited by a half-savage people, who led an ambitious life, sometimes needing and sometimes roaring from one island to another: the road through which were the worst in the world."

In 1767 all the Fens were taken in except the lowest lands which comprised about 40,000 acres of land, and are now known as the East, West, Wildmore, and Fen. These were finally enclosed by Sir John Ronnie in 1805. Canal works drained were constructed to this whole district, to catch the water coming off the uplands, to supply it into the drain and foster drainage. They are quite independent of the system which receives the Fen to its "internal water". The whole area of the William fens was now brought into cultivation, an area altogether of 680,392 acres.

Geology.

The area under consideration, being the Tilligga river, shows the usual formation of such: viz., an alluvial deposit laid down by a river entering an arm of the sea.

First Stage

Very stiff clayey bottom, consisting of what is known
as Kimmeridge Clay, forming part of the East Anglian Delta System. This was gradually covered by river deposits, which rose slowly above the level of the sea, to be floored by tides and floods.

Second State

Enlarged by the Romans: cultivated, covered by forest growth. By marsh growth: whereby in places a peaty loam was laid down.

Third State

Drains and banks neglected: sea floods overflooding again: sand and mud deposited on the peaty loam.

Fourth State

Present condition of things.

All of these four states can be traced when sinking a well in almost any part of the Wildmere Fen. Diagrammatic Section attached.

Section Through Witham Fens from Sleaford to Wainfleet.
Water-supply.

There is no deep supply in these Fens. Beyond the Skidford ridge of Oxford Clay, artesian wells have been successfully sunk; but in this deep supply seems to lie only between the Dolomite and Oxford Clay, efforts to find water in the Fens have been vain, though successful to a depth of 372 fath at Boston.

The water supply of the Fens is therefore derived from rivers, drains, ponds, shallow wells, or rain collected in cisterns. In the Union it suffered by the eviction the inhabitants were entirely, dependent on rainfall, drains, and wells.

The surface water sinks through the upper layer of loose soil till it reaches the impermeable clay bottom. Over the surface of these streams is the direction of the general trend of the Clay, standing on the soil is a level varying directly as the rainfall. The same factor determines the quantity of water found at any time in the drains and shallow wells. In a wet year the soil above the clay bed is saturated, the ground water stands high in the drains and shallow wells. In a dry year the drains suck the last drop of water out of the ground and the wells dry up.

Rain-water Cisterns

The water thus collected is used chiefly for washing purposes. The cisterns are mostly small and supplied with seldom disturbed 2 months' drought. The roofs of churches and schools ought to be utilised by County Councils and Sampling Authorities in such Districts, as the Skidford.
as collectors of large stores of pure soft water for the general benefit of the community. I feel certain this would be productive of much more good than most of the cooking, ambulance, firefight, and other technical methods of spending public money.

Wells.

These are sunk through the soil to a depth rarely exceeding 15 to 20 feet. They have no springs: but have springs: they nearly fill up from below with the ground water that is percolating through the soil on its way over the clay bed to the drains. The water in the wells, that in the dykes, that in the drains, rise and fall simultaneously, they are one and the same water.

Every shower of rain falling on the surface of the land dissolves a quantity of surface impurities lying there, carries it down, widens out of sight. As it runs away towards the drains, it passes up into any well that also in the line of its journey. The manure on the fields, the leakage from outside privies, the steps thrown out from the houses, the leakage from pig sties, farm yards, stables, dung heaps, all accompany the water into the wells and drains in the same way.

Moreover, a well sunk in proper soil acts within a certain radius as a vacuum or sucker. It sucks up through its floor water to the level of the "sub-superficial" stream that is on its way to the drains. The water thus arriving in the well holds in solution all the impurities enumerated in the last paragraph. In wet weather the wells are full,
and the solutions are well diluted; in dry weather the wells are nearly empty; the solutions become more or less concentrated. During a long drought the surface impurities collect and are not washed away. When rain comes, the first water going into the ground thence to the wells, will be charged with dissolved sewage from salines. This was a sufficient cause of the occasional outbreaks of sore throat during the dry summer of 1893. It also explains the passing of the diphtheria germs with general circulation as the long summer drought gave way with the September rains.

I had the following analyses made of the water of a spring largely used as a source of drinking water during the diphtheria epidemic. The water in quantity, quite unfit for domestic uses. That though it was taken after the epidemic was over, the well weeds.

### Analysis of Fen Water

**Expressed in parts per 100,000.**

<table>
<thead>
<tr>
<th>Dissolved Matters</th>
<th>Total Solid Impurity</th>
<th>Organic Carbon</th>
<th>Organic Nitrogen</th>
<th>Ammonia</th>
<th>Nitrates (NO₃)</th>
<th>Total Combined Nitrogen</th>
<th>Previous Sewage or Animal Corrosion</th>
<th>Chlorine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>110.40</td>
<td>1.327</td>
<td>1.59</td>
<td>0.80</td>
<td>-</td>
<td>2.25</td>
<td>3.40</td>
<td>12.75</td>
</tr>
</tbody>
</table>

### Hardness

<table>
<thead>
<tr>
<th>Temporary</th>
<th>Permanent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.2</td>
<td>42.1</td>
<td>67.3</td>
</tr>
</tbody>
</table>

There is none.

3. Personal habits, &c., of the inhabitants:

The whole more is purely an agricultural district, with the villages of New York, Bawder's Hill, Comingsby, and Tattershall lying within or near its boundaries. The classes attacked by the epidemic were:

1. Farmers and their families.
2. Farm labourers and their families.
3. Miller and their families, &c., employees.
4. Shopkeepers, &c., in New York, Comingsby, &c., Tattershall, &c., their families, &c., employees.
5. Publicans and their families.

Dwelling-houses

The homes of the majority of the patients were small 4-roomed houses; brick walls; brick or beaten earth floors; poultry-things are universally kept, &c.
horses and pigsties are always quite near the dwelling house. Poultry have been accused of spreading diptheria, but these latrines, however, the poultry run in and out with absolute freedom.

**Sleeping accommodation**

is generally defective. It always so when families are large. The MT. recently visited a family in Coningsby, floor, who were housed away in the number of 9 in a house containing one sitting room and two bedrooms. Such abuses of things during an epidemic of diptheria require no comment. The following figures show the number of different cases appearing in families:

**Johnson** 9, 15, 25, 26, 36, 39.
**Atkinson** 2, 8, 14, 48, 49.
**Kent** 12, 18, 20, 21, 22, 30.
**Blackburn** 53, 56, 57, 58.
**Greenfield** 18, 27, 38, 50.
**Ingham** 4, 5, 29, 30.
**Woodcock** 7, 16, 17, 46.

**Schools.**

All the children affected by the epidemic in Willemore attended the Board School at Humble House. Those in Coningsby, Carterhall attended the Voluntary Schools in those places. Out of 86 cases strictly within the Willemore District, no less than 84 were either scholars or Humble House School, or had a member of the family attending that School.
Chapels:

are the great meeting place of these times for the adult population. The people are practically all Wesleyans, and are very regular attendants. I have already alluded (p. 6) to the disastrous effects following a Wesleyan Sunday School Feast at New York.

III. Special Note

on the Climate and Water-supply of 1893.

In the early summer of this year the longest rainless period on record in Lincolnshire occurred. During 53 days from 1st March to 19th May, 0.29 in. of rain fell. The total rainfall for the four months of March, April, May, and June amounted to only 2.90 inches, a deficiency of 4.23 in. below the average.

The whole summer continued abnormally hot: August was the hottest August for 28 years. The heavy clay lands, which grew in ordinary years heavy crops of wheat and barley, now yielded with great pictures: the cornfields shone like snowless, served on hundreds of acres better furnished than to feed the stock: wells ran dry; rain-water
cisterns had been empty for weeks and even months: the only available water lay green and stagnant at the bottom of the larger drains.

At the end of August the drought broke up with heavy rains, and on the 4th of September the first case of Diphtheria appeared.

IV. Points raised by the epidemic:

a. Spread.

If the bacterial origin of Diphtheria be taken as one of the facts of medicine, the Bacteria or their spores must be dormant universally between epidemics, waiting for suitable conditions to bring them again into active life. These conditions were found in the epidemic epidemic in

1. The influence of the long drought in making the water highly suitable medium for the Bacilli.
2. The unhealthy state of the children's throats produced by the heat and the water, offering a suitable soil for the growth of the Bacillus, showing a predisposition to attack.
If it be allowed that every slough and drain was a possible nidus of active Bacteria awaiting only the rain to enable them to grow & to be washed into general circulation, the origin of the epidemic need not be looked for further. Certainly the first case was, to speak, simultaneous. Mrs. Maidens had not been away from home for months; she had had no visitors; she had not been in any way that I could ascertain involved in outside infection.

Twenty days afterwards the school children commenced. None of the early cases had come into contact with Mrs. Maidens, or with any member of her household. The three first cases from the school lived at Roshit's Farm, Hunsdon; James D. Coombes of Roshit Lane; as far apart from one another as the three angles of an equilateral triangle. The lines of the drainage is from Mrs. Maidens's house towards Attenham's, but away from Hammond (No. 2) and Attenham (No. 4 and 5).

The rush of cases following within a week of the opening of the school, let me to suppose that some child at school must have had the disease or acted as the original centre of infection. But I could find no proof of this. No child was evidently ill at school before the outbreak of the 26th Sept. The schoolmaster is positive that no case at school preceded the four cases of the 26th, & certainly there was no such case outside the school. The three cases occurred in three separate departments of
of the School; No. 3 in the Infant School; No. 2 in the 6th Standard; No. 4 in the 4th Standard.
They did not even sit in the same room.

It seems impossible to reach the conclusion that the case was spread over the floor, it was a general spreading. It spread, of the latest crop of germs. See note on No. 69, p. 6.

Once the disease began, it spread was practically by contact alone. I have already noted that 54 out of 56 bichrome cases were schoolchildren or their immediate relatives. Mrs. Moore, No. 65, caught it by kissing her daughter, against which I had repeated sterilisation. Dr. Ashdown caught it from a child whose mother he was examining without wearing the mask which every doctor should employ when examining diphtheria cases.

At the New York School first three children from Farmery's attended while their sister, brother were still lying ill upstairs. Beside them sat his Winner children: Martha Moore sat on the bench immediately in front of them; Martha Moore went to lie at No. 66 calfs after the floor case. Results:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Martha Moore</td>
<td>recovered</td>
</tr>
<tr>
<td>11</td>
<td>Robert Veilie</td>
<td>died</td>
</tr>
<tr>
<td>18</td>
<td>Mr. Meleady</td>
<td>died</td>
</tr>
<tr>
<td>20</td>
<td>Herbert Veilie</td>
<td>died</td>
</tr>
<tr>
<td>20</td>
<td>Mr. Moore</td>
<td>died</td>
</tr>
<tr>
<td>23</td>
<td>Julius Veilie</td>
<td>died</td>
</tr>
</tbody>
</table>

Again, William Woodcock, who commenced
wild attack on the 13th October, walked up to Coningham.

About 3 weeks after, bought some goods at the ship of Mr. Blackton, the 'Vorrough'. Results:

6. Mr. George Blackton - died
7. Sillit - recovered
8. Florrie -
9. Ben -

3. Course of Individual Attacks:

Broadly speaking, the disease showed two types:

1. Mild, which recovered.
2. Malignant, which died.

Between these two were a few cases, which, by special circumstances, such as good nursing, capacity for taking support, or the will to get better, did get better, or which, by the absence of those special circumstances, failed to recover, or died after the acute stage had passed, fromanimation depending on a too streneuous resistance of the whole economy, or from a paralytic becoming general. Asthenia had not then been discovered.

The hardness of the glands at the angle of the jaw is an important diagnostic feature. I found much malnutrition swelling a real sign. Unquestionably the disease was more fatal among the plump, fleshy children than among the thin. Many of the adults who died might have been saved had they lived up sooner. They killed their chance of recovery by
continuing to try to work after they ought to have been in bed under treatment. Such a case naturally
was Mr. Melton, No. 62, who actually stood in
the wash-house at the breakfast on at least the 3rd
day of the disease. Of course there was a disease
in which every ounce of strength ought to be used;
refused this is it. Dr. Ashdown again, consulted
Dr. Pilcher in Boston about his throat on Tuesday:
on Thursday, he saw patient at home: on Friday
he was confined to his room: on Monday morning he died.

**Laryngeal cases:**

Georges Blackman, No. 55, was the only case I had of
from laryngeal diphtheria. When the boy appeared
moribund the parents gave their consent to try doing
Tracheotomy. He rallied wonderfully, but died suddenly
of cardiac failure, 18 hours later.

**Implication of the Nasal passages**

I removed a sign of evil omen. No. 71 was, as far as I can
recall, the only recovery I had after it.

**Appearance of Palate and Tonsils**

There is a dull, angry, vicious redness over Palate and
Tonsils that is characteristic of Diphtheria. It has not
the vividness of follicular Tonsils. The Membrane is
darker & deeper looking: not so creamy as in the other.

But even at the very end of the epidemic, I was quite
unable to say positively for a day or a couple of days
whether I had Diphtheria or Follicular Tonsils to
deal with. One case cases of each complaint which
are at once recognisable: but there is a large
Delicate lying between the two, which requires time to clear up the debility up the attack. Moreover, many households that escaped Diphtheria had children down with Tubercular Pneumonia; and in these at least, families I had both diseases appearing simultaneously in different members of the family.

**Delicate and Strong Children**

I did not find that the delicate children in a family had the severest attacks; quite frequently the case was exactly the opposite, the strong child the worst recovered. The healthiest families attacked by the epidemic were undoubtedly those of:

- Morley... No. 76, 77, 78.
- Horlick... No. 65, 68.
- Johnson... Nos. 9, 15, 26, 26, 36, 39.

Of the first two every case died; of the third out of 5 cases 4 died; one of the recoveries being the father.

**Post-Diphtheritic Paralysis**

Paralysis of the palate was universal. All showed it.

Paralysis of the accommodation of the eye occurred in 68% of the cases which recovered. In two cases, No. 80 and 53, it lasted for over 3 months.

Paralysis of the lower extremities occurred in 32%, but in about 10% of these it was very slight. The worst case I had of it was Bessie Davenport, No. 84. This was also the longest case I had of ocular paralysis, it was the only case in which I had the opportunity of using Antitoxin.

In two cases, No. 53 and 81, who lived respectively...
for 19 and 44 days after the development of the
chorea, the post-diphtheritic paralysis became gener-
al, involving digestive, motor, typically cardiae
functions to the extent of rendering life impossible.
Nutrient enemas, hypodermic injections of strychnine,
massage failed to keep them alive.

y. Mortality

Over the whole epidemic:

Cases 84
Deaths 36
\[
\{ 84 \} = 42.85\%
\]

The incidence of cases was, as in most
epidemics, heavier both in actual numbers and in
mortality upon the young children. I have given
upon page 16 a comparison between the numbers
of the children who showed hyperpyrexia of the typhus,
both their ages, and the incidence of mortality in the
diphtheritic epidemics with the ages.

I find that out of the 36 deaths, 21, or more
than half (58.3%) died before the 5th day; most
of them on the night but between the 4th and 5th days. Of the
remainder 13 died on or before the 10th day = 36.17 %;
while 20, who survived the 10th day, died subsequently,
one 19 days, the other 44 days, after the appearance of disease
= 5.6%.
These last notes put into tabular form show:

**Duration of fatal cases:**

- Death between attack and 5th day ........... 58.3%
- - 5th day - 10th day .................. 36.1%
- - after the 10th day ..................... 5.6%

**Age Table of cases, showing percentages both as to age and mortality.**

<table>
<thead>
<tr>
<th>Age</th>
<th>Nr. of cases</th>
<th>Nr. of deaths</th>
<th>Percentage of Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 1</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>3</td>
<td>60.0%</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>3</td>
<td>60.0%</td>
</tr>
<tr>
<td>5</td>
<td>49 cases</td>
<td>26 deaths</td>
<td>53.0%</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>2</td>
<td>66.6%</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>4</td>
<td>50.0%</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>2</td>
<td>25.0%</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>5</td>
<td>55.5%</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>1</td>
<td>20.0%</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>1</td>
<td>25.0%</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>13</td>
<td>4</td>
<td>1</td>
<td>25.0%</td>
</tr>
<tr>
<td>14</td>
<td>15 cases</td>
<td>6 deaths</td>
<td>40.0%</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>OVER 16</td>
<td>10 cases</td>
<td>4 deaths</td>
<td>20.0%</td>
</tr>
</tbody>
</table>
The mortality, therefore, as might be expected, falls heavier on the young. In children under 10 there were 49 cases with a mortality of 53%, compared with 15 cases between 10-16 with a mortality of 40%, and 20 adult cases with a mortality of 28.57%.

8. Incubation.

I could form no definite conclusions on this head, they note, those cases of apparently not more than 48 hours incubation, while others seem to run two or three weeks. The difficulty is to eliminate the factor of subsequent Contagion. For instance in the case of the three Leggatt boys:

7 June - Albert Leggatt... died 21 July
2 July - Bertie Leggatt... died 5 July
6 August - Neville Leggatt... recovered.

After Bertie's death, I sent all the family & the occasion where including Albert who was convalescent but feebly of week. On his return 10 days later Albert seemed no better, there was within a day or two of coming back. The house was disinfected while they were away; yet on the 6th August Bertie was stricken with the disease, while his brother, Bertie, simultaneously developed follicular pustules. Probably the infection here was in some overlooked corner of the house: it is difficult to say.
E. Quarantine:

I was much struck with the tendency of the disease to make a fresh start after an apparent cessation, its interval being something between 17 and 35 days, but generally about 3 weeks. Thus there elapsed 20 days between No. 1 and 2. There were 14 days between the deaths of No. 7 and the reappearance of the disease in his father, No. 46. There were 24 days between No. 57 and 57. 27 days between No. 71 and 72: 17 days between No. 75 and 76; and 87 days between No. 78 and 79.

Again in 1894, there were 28 days between No. 81 and 82: 35 days between No. 82 and 83.

My experience has convinced me that the time given in the best books is too short: that a 6 weeks' quarantine from the date of the disappearance of the membrane is not a day too short — especially when one considers the exceedingly serious nature of the disease, the method of spread by contagion. Others say "at least two weeks should elapse after recovery (whatever that means) before the child is allowed to mingle with others"; Taylor says nothing at all; Goodhart says three weeks after the disappearance of the membrane. I consider these all too short.
Treatment.

My cases occurred, with the exception of No. 84, in the two years which immediately preceded the discovery of antitoxin. My notes on treatment, therefore, are behind the times; but as antitoxin has not proved quite the unqualified success it was expected to be, it needs to be supplemented when it is used, I give my notes for what they are worth.

Antitoxin used: Comparison with older treatment.

No. 84. Lizzie Trafford, aged 16.

I prefer to precede my notes on treatment with this case although it was actually the last of the epidemic, was the only one in which I had the chance of using antitoxin.

I was called in to see her on the evening of the 6th of June, 1894. There had been no diphtheria in the family for 10 months. On examining her throat again next morning there was another it was diphtheria, or bed case.

She was an anemic but plump tooth-developed girl of 16, just the case which my experience of the past few years showed was likely to be severe. On the morning of the 7th, the tonsils were covered with membrane, the breath was foul, the swallowing with considerable difficulty, already with some congestion into the nose, she was feeble & listless; everything in fact looked wrong.

By past experience I was quite prepared to expect death in this case on the night between the 24th & 25th days.

I telegraphed for antitoxin, which arrived between 8 o'clock at 8 P.M. on the 7th. I saw her again at 8 A.M. on the next morning, and was as surprised
to find that the whole viscid membrane had sloughed off during the night. This was unfortunately due to the antitoxin; without it, that membrane would not have cleared for at least 3 more days. More often other 83 cases behaved in any way like this.

By 8 p.m. the membrane had partially re-formed. I gave her another injection of antitoxin. In the early morning a membrane - cast of the deeper parts of the Pharynx separated, fully 2½" long. No further formation of membrane took place.

Nevertheless, the post-diphtheritic symptoms were very severe. Bulbar paralysis + paralysis of the lower air passages lasted for over 3 months, + in spite of a month at the seaside, Cowes and +. The girl was still debili- cated 6 months after the throat cleared. Still, I doubt, after this experience, as soon think treating diphtheria without antitoxin as curing without Quinina. Even if it have not affected upon the fatal symptoms, may even if it accentuates them, that did 15 days matter compared to pulling the patient alive through the first 7 or 8 days.

Yet I fear that my experience in the previous 83 cases amounted to little better than this, that there, which were to die, died; that those which were to recover, recovered. Occasionally one had the satisfaction of feeling that careful attention, or nursing, or something done as the critical period approached, had weighed the scale down to the side of life.
Diet

The difficulty is not the choice of food, but the getting patients to swallow it. In several cases I found less difficulty in getting solids or semi-solids than liquids. Ice is a most valuable adjunct: in all but the mildest cases stimulants are required. Patients who can swallow, for the most part recover: but forcing food upon young children is a most painful business, and medical men may be thankful that generally they have only young directions, having the carrying out to others. I did not find much value in nutrient enamels.

Local Treatment

I beyond a doubt of great value. I found more benefit from the use of the spray than anything. I used a spray of a dilute solution of Corrosive Sublimate, I find it the best. It keeps the throat cool; it clears out the coating phlegm and sores; and the hotter patients can see it themselves and continue it, which is a matter of great importance when the danger of nurses is considered. I preferred it to washing out the throat, it is quieter, and there is no risk of the nose. Syringing Noses

Should be done in every severe case, whether the nose is implicated or not. I employed Cody’s fluid. The nasal passages always became trouble some in any severe case unless the syringing is begun early.
Sulphur

Sulphur, pretty often both as a laxative and a dust. I think it does some good.

Caries

I hunted cases with Acid. Hydrochlor. I cannot say that any benefit whatever resulted. I did not try any Solvents, such as Pepsin.

Poultics

I found the hotten pack often from much relief.

Constitutional Treatment

Large doses of Trich. Ferri Perchlor. with Potas. Chlor. and Glycerin, seemed to have the best effect. It is nauseous taking, & the young children have it worse than anything.

When the state of pulse accentuated the patient being put on Amn. Carb. & Baryta, the progress is found very favorable. The rapid running-away pulse on the 4th or 5th Day is in my experience an absolutely hopeless sign. I have never seen a recovery.

Tracheotomy

I performed in only one case, No. 663, which was the only purely carbuncular case I had. The operation prolonged the boy’s life for about 12 hours, when death ensued from cardiac failure. This seems to be a lamentable frequent result of Tracheotomy in Diphtheria.
Household Rules for Disinfection:

1. Patient to be kept by himself; no person who enters on him never to take meals with the rest of the household, unless to enter the rest of the house without first changing clothes, thoroughly washing.

2. A sheet across the outside of the bedroom door to be constantly splashed with carbolic water.

3. A bucket to stand outside this sheet containing carbolic and water, in which all plates, spoons, forks, etc. are to be placed for removal from bedroom.

4. Masks to be made for and worn by all attendants on the patient.

5. Gargles of carbolic and spirit of white wine to be used regularly by the attendant; 3 or 4 times a day.

6. All superfluous matter to be burnt, or buried with strong carbolic before leaving out.

7. Burn every drop of water used in the house.
Examination for Hypertrophy of Tonsils made of the Children attending Wildmore Board School on 23 Feb. 1897.

<table>
<thead>
<tr>
<th>GIRLS</th>
<th>BOYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nr</td>
<td>Age</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td>2</td>
</tr>
</tbody>
</table>

Girls
- Enlarged: 37 = 66%
- Not: 19 = 34%
- Total: 56

Boys
- Enlarged: 32 = 65%
- Not: 17 = 35%
- Total: 49

Together
- Enlarged: 69 = 68.71%
- Not: 36 = 31.29%
- Total: 105

See page 16