

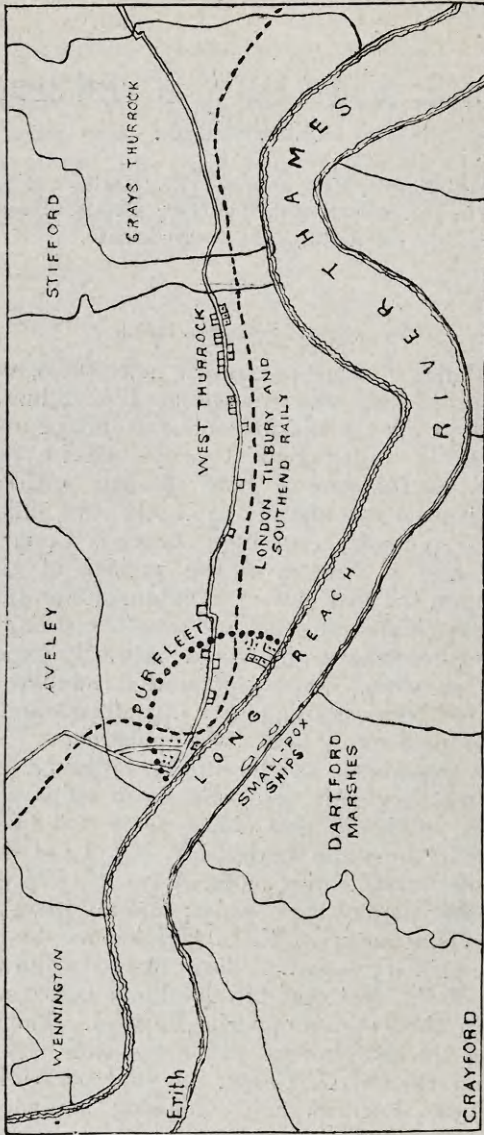
SMALL-POX HOSPITALS AND THE SPREAD OF INFECTION.

By JOHN C. THRESH, M.D., D.Sc., D.P.H. ; Lecturer on Public Health,
London Hospital Medical College ; Medical Officer
of Health, Essex County Council.

(*Read: April 18th, 1902.*)

THE prevalence of small-pox in the metropolis, and its consequent spread into the county of Essex, has naturally caused me to give a considerable amount of attention to this disease, in order that I might advise the various authorities in the county how to deal with any cases which might be introduced, promptly and efficiently, to prevent an epidemic occurring. There is a population approaching half a million in the portion of the county abutting upon the east end of London, and as this population consists chiefly of working people residing in somewhat crowded cottages, one would naturally expect that it would be in these densely-populated suburbs that the disease would be most frequently introduced, and in which it would be most likely to become epidemic.

Previous experience in the county, however, had led me to doubt whether this was the most vulnerable point. During the epidemic prevalence from 1893-95, it was observed that the much more thinly populated district included in the Orsett Union suffered far more in proportion than any other part of the county ; and my investigation of the cases which occurred there had led me to infer that most of the primary cases had been infected from the small-pox ships of the Metropolitan Asylums Board, which are anchored in the Thames opposite Purfleet. The appended map shows the position of the ships with reference to Purfleet and the Orsett Union. I paid particular attention to these Purfleet cases, making inquiries of the patients and of their friends, and visiting the works and other places where those engaged in work away from their houses were employed. The result left little doubt in my mind that there was some influence at work not common to other districts in which small-pox had been introduced, and



that this factor was the proximity of the hospital ships. Unfortunately, I also found that there was a certain amount of intercommunication between these ships and the Essex

shore, and this afforded a possible explanation of the introduction of the disease, although it was not traceable. It sufficed, however, as an explanation to those who did not believe in the air-borne theory of conveyance of infection; and at the request of the Essex County Council, the Metropolitan Asylums Board undertook to so alter their arrangements that all communication with the Essex shore should be prevented, so far as laid in their power. This fact is of great importance in connection with the present outbreak, as I am convinced that the Asylums Board have fulfilled their promise, and that there has been no personal communication between the ships and the county, save probably the surreptitious visit of a man to his sweetheart. The only case of this kind I can hear of has been denied by the parties concerned.

Dr. John C. McVail, in his Paper on the Aerial Convection of Small-pox from Hospitals, read before this Society during the Session 1893-4, has discussed so fully the possible effect of the removal of patients, movements of medical officers, nurses, and workpeople, on the inhabitants around, that I purpose only referring to these dangers in so far as they have come under my personal observation during the present outbreak in Essex.

(a) *Removal of Patients to Hospital.*—Where an isolation hospital is established, one or more persons must be employed in the removal of patients, and the ambulance must pass along streets and highways. We have had complaints of the men in charge of such vehicles stopping at public-houses, and of groups of children standing round the ambulances, their curiosity being aroused by the peculiarities of the vehicles. I have not, however, yet met with a case which could be attributed to infection from this vehicle; and along the routes to two of the hospitals in this county which have received hundreds of cases, no indications have been found of the disease being spread in this manner, though I am not prepared to say that such is impossible. The driver of one ambulance, who unfortunately was not re-vaccinated, contracted the disease, although he did not touch either the patient or any article removed in the ambulance. The danger arising from the removal of patients, providing every care is taken, is, in my opinion, infinitesimal.

(b) *Visits of Friends.*—That persons visiting relatives or friends in a small-pox hospital often contract the disease is a well-known fact, and has led the hospital authorities to interdict all such communication save when a patient is *in*

extremis. Unfortunately, visitors frequently refuse the offer of re-vaccination, and no authority has proved strong enough to make re-vaccination imperative before permitting a visit. Cases arising from this cause have occurred in connection with two hospitals in the county, and several persons who have visited at the hospital ships have been attacked. Amongst the poorer classes the dread of infection is not marked, and, as a consequence, they often go to the hospitals either out of mere curiosity, or on the chance of seeing some friend. At the large hospital at Dagenham, to be referred to later, so many people come on the Sundays and attempt to climb the fences to see or communicate with the convalescents, that special police, and all the attendants who can be spared, have to be set on to patrol the ground outside the hospital boundary. Obviously such visitors run some risk, but I have only heard of one case where it appeared probable that this fence-climbing had been the source of infection.

Intercourse of Staff with Persons Outside.—No case has come under notice of infection being conveyed outside by medical attendants, nurses, or other members of the staff of any hospital in the county; but one case has come to my knowledge where small-pox occurred in a house to which a nurse had sent a cloak. Where proper precautions are observed this danger is obviously not great, and in my opinion it has been greatly exaggerated by persons opposed to the air-borne theory, and by medical men and others who have little or no experience in connection with small-pox hospitals. In my opinion it offers no explanation of the prevalence of the disease in the proximity of a well-managed hospital.

Workmen Employed near a Small-pox Hospital.—It is practically impossible to provide a permanent hospital sufficiently large to cope with any outbreak which may occur: hence in many cases temporarily buildings have to be erected in proximity to the permanent hospital, whilst the latter is full, possibly to overflowing, with acute and convalescent patients. Amongst persons so employed infection is very frequent, and occasionally such workmen have introduced the disease into their families, although they themselves have not been attacked; that is, they have been the intermediaries for the conveyance of the infection. Amongst the men employed in putting up temporary buildings at the Orsett Hospital, 5 were attacked with small-pox, and the brother of a man working there was attacked. Up to the present I have only heard of 2 cases

amongst the men erecting the buildings at the hospital at Dagenham, owned by the Corporation of West Ham, and used also by arrangement by several adjoining districts in Essex; but as most of the men reside outside the administrative county, I have not yet been able to ascertain how many have been attacked. In East Ham and Ilford I have reports of 6 persons notified, who had been engaged on the temporary buildings now being erected by the Metropolitan Asylums Board, and of 2 other cases apparently infected by relatives working at the same place. In one instance a man infected his brother, and in the other the son infected his father. By the courtesy of Dr. Richmond, I have been able to examine his books giving the results of his investigations of the origin of the cases in the Dartford Rural District, in which the new hospitals of the Metropolitan Asylums Board are situated, and out of 115 persons attacked no less than 24 were employed at the hospitals. In the urban district of Dartford, Dr. Hamilton informs me that there have been 221 cases of small-pox since September 20, 1901, when the first occurred. Of these no less than 95 were employed at the hospital buildings, 41 were infected by workmen employed at the hospital and residing in the same house as the persons attacked. Out of the remaining 85 cases only 5 could be fairly definitely traced to a pre-existing case or probable source of infection. Several metropolitan borough medical officers of health have informed me that cases have arisen in their districts amongst workmen employed at the temporary hospitals, and amongst their families. The total number of the cases due directly and indirectly to this cause, we may never know; but, certain it is, that these men are spreading the disease broadcast through the districts to the East of London.

It is obvious, therefore, that a considerable amount of danger is attached to working in close proximity to small-pox hospitals where a large number of patients are under treatment, and the question naturally arises, how do these people become infected? I have not heard of or observed any similar results ensuing amongst men engaged erecting temporary hospitals for other diseases; and from our knowledge of such diseases as scarlet fever, diphtheria, and typhoid fever, we should not expect to find infection spread in this manner. Doubtless direct infection is responsible for a certain number of cases; but it appears certain that most of the infected persons have never come in contact with any patient, and that some other explanation is necessary to account for the large number of cases

which occur. This factor is the conveyance through the air of the infective material from the patients in the hospital to the persons around. That infection can take place without actual personal contact is generally, if not universally, admitted; but whilst some would limit the "striking" distance to a few feet, others will extend it to hundreds of yards. This brings me to the most important part of my subject: the aerial conveyance of infection from small-pox hospitals.

Aerial Conveyance of Infection.—In 1894, Dr. McVail, in the Paper already referred to, stated that his purpose was "rather to review existing knowledge than to adduce new facts;" and in his most admirable and instructive review he shows that this is no new theory, but one which has been frequently discussed during the last hundred years. In fact, wherever there has been a large aggregation of persons suffering from small-pox, cases appear to have occurred amongst the inhabitants around, which could only be accounted for by the infection being air-borne. After considering the arguments for and against aerial convection, he says:—

"Summing up the evidence, as far as it is possible to sum up on a subject as to which so much is still to be learned, we seem to reach the general conclusion that, as a result of the simultaneous action of causes favourable to the spread of infection, the contagium of small-pox may be conveyed atmospherically to a distance much greater than had been usually admitted—a distance measurable by quarters of miles." He also adds: "The practical conclusion of this whole question may be said to have already been arrived at. Small-pox hospitals are not now erected in the midst of towns, and those already in existence are being more and more sparingly used. Indeed, when the power of aerial convection is still doubted, it seems to be assumed that the prevention of personal communication is impracticable, and that accidents incident to the system of hospital treatment of small-pox within populous districts must be accepted as inevitable; so that the only remedy under the one theory, as under the other, is the removal of such institutions to a distance from populous places."

I differ from Dr. McVail, however, in not believing that the practical conclusion has been arrived at. It is probably not sufficient in all cases to place such institutions at a distance from populous places. It may be necessary to avoid having large institutions, with consequent large concentration of patients, and therefore of infective material, by

substituting for these a number of smaller hospitals, or a number of tent encampments, in which this concentration of infection cannot occur, or only to such an extent as to reduce the danger of the dissemination of the disease to a minimum. Small-pox hospitals do not necessarily cause widespread prevalence amongst the population around; on the other hand, they may spread the disease over a greater area than is generally conceived. The experience in Essex during the present epidemic has been particularly interesting, and will probably tend to throw a little more light on some points of this much-discussed question of aerial conveyance of infection. During this and previous epidemics I have seen a number of cases isolated in their own homes without any spread of infection, either among the inmates of the respective houses, or amongst the neighbours where the house has been one of a row or group. In most of these cases revaccination has been submitted to by the other inmates of the houses, not always by all the inmates, and generally by very few of the neighbours. My experience has not led me to recommend the County Council to urge the provision of a few large hospitals to serve the whole county, but rather to urge each district to provide temporary accommodation for such cases as may occur, and I always recommend the use of tents. Throughout this epidemic I have had charge of three such hospitals, and I have on previous occasions had charge of similar ones in which from 1 to 8 cases have been treated at a time, and there has never been the slightest reason to believe that any person has been infected from such hospitals, although they have sometimes been near groups of houses or populous villages. With large hospitals my experience has been somewhat different. To take first the Orsett Hospital, which serves the Orsett Union, comprising the Orsett Rural District and Grays Urban District, this hospital was originally erected for small-pox, in consequence of the prevalence of this disease in the district during the epidemic of 1884, when the cases from London were first sent down in any number to the hospital ships in the Thames. After this epidemic had ceased, it remained unused so long that the authorities decided to use it for infectious diseases generally, and it was being so used when small-pox broke out in London last year. Directly cases began to occur in Purfleet, the patients in the hospital were removed, and the small-pox cases taken in. About twenty beds were available, but cases cropped up so rapidly that additional accommodation had to be provided in the shape of wood

and iron buildings and hospital tents. The maximum number of patients in the hospital at one time was over 100, and they certainly were crowded together more than was desirable. Several workmen engaged on the temporary buildings were attacked with the disease, but only one other person working or living near has been infected, so far as I can learn. The hospital, however, is on fairly high ground, and very isolated. There appears to be only one house within a quarter of a mile, and only three or four between a quarter and half a mile, the same number between half and three-quarters of a mile, and only one small group of houses just within the mile. Beyond this limit lies the town of Grays, nearly the whole of which lies within the mile and a half radius. The distribution of small-pox in the parishes around does not appear to indicate that this hospital has had anything to do with the aerial dissemination of infection, but it is just possible that the influence, if any, is masked by the effect of other and more important factors.

The small-pox hospital at Dagenham is much more important than that at Orsett. It is a properly-equipped hospital, with sixty beds, and an administrative block sufficiently large to serve a hospital three or four times the size. It was provided to serve a population of over half a million. It stands in the centre of an estate of 120 acres, and though not so isolated as the Orsett hospital, the nearest village, Dagenham, is beyond the half-mile radius. The spread of small-pox in West Ham and other districts connected with this hospital has recently been so rapid that temporary buildings have had to be run up as quickly as possible. At my last visit (April 2nd), there were 350 patients and 40 more were waiting for admission. As I have already remarked, a number of persons working here have been infected, and there is considerable communication with the village of Dagenham, in which is the nearest railway station. Up to the present there has been no epidemic prevalence in this parish, but 2 cases occurred there in January, 2 in February, and 7 in March; and it is very probable that the influence of the hospital is beginning to make itself felt. The progress of events is being carefully watched, and the results will be fully noted.* Already the proportion of cases to population is higher in Dagenham than in any other town or village in the Romford Union, save that of Rainham, but as yet it would be unsafe to draw any inferences.

* The disease has since spread into the adjoining parish of Hornchurch, where many cases have occurred during the present month (April).

The hospital ships of the Metropolitan Asylums Board, with reference to which I have already contributed an article to the *Lancet*, which appeared in the issue of February 22nd of this year, lie in the Thames just outside the county. They were placed opposite Purfleet in 1884, and since that time there has been an excessive prevalence of small-pox in the Orsett district, and especially in that portion lying nearest the ships. The deaths from small-pox in the Orsett Union and in the remainder of the administrative county of Essex, are given in the subjoined Table; divided into two periods, the first for thirteen years prior to the ships being used for isolation purposes, and the second for the eighteen years after that date.

	Deaths from Small-pox.		
	In Orsett Union.	In Remainder of County.	In London per Million Population.
1871-80	24	350	457
81	0	18	619
82	1	16	111
83	0	5	35
	—	—	
	25	389	
	—	—	
1884	9	20	313
85	14	49	357
86	0	6	6
87	0	1	2
88	0	0	2
89	0	0	—
1890	0	1	1
91	0	3	2
92	0	2	10
93	4	3	48
94	1	27	20
95	5	4	13
96	0	0	2
97	0	0	4
98	0	0	0
99	0	0	1
1900	0	0	1
1901	16	11	5
	—	—	
	49	127	

Mean population, first period ...	16,456	...	337,612		
Death-rate per annum per 1000 population	.117	...	.089	...	.41
Mean population, second period ...	27,000	...	480,000		
Death-rate per annum per 1000 population	.101	...	.015	...	.044

Prior to the floating hospitals being established near Purfleet, small-pox was little more prevalent in the Orsett district than in the remainder of the county, and only from one-third to one-fourth as prevalent as in the metropolis. The change since then has been most marked, for on the same basis the disease has been seven times more prevalent in Orsett than in the remainder of the county, and two-and-a-half times more prevalent than in London. If the decrease in the Orsett district had been as great as in the remainder of the county, the death-rate would have been .019 instead of .101, or less than one-fifth; whereas, had the fall been as great as in London, the death-rate would have been .0125, or less than one-eighth the observed rate. In other words, small-pox is from five to eight times more prevalent in Orsett than it should be, taking the number of deaths as the basis of our calculation.

In investigating the cause of this excessive prevalence it is necessary to ascertain the particular parishes in which the disease has occurred. Unfortunately, I have no personal knowledge relating to the epidemic of 1884-85, but the statistics for the years 1893, 1894, and 1895 are particularly interesting and instructive. They are given in the following Table:—

—		Cases in West Thurrock.		Cases in Remainder of Orsett Rural District.
1893	...	21	...	32
1894	...	7	...	7
1895	...	11	...	7
		—		—
		39		46

Out of the 85 cases which occurred in the whole of the Orsett Union, with a population of over 27,000, no less than 39 occurred in the parish opposite the small-pox ship with a population of only 2,540. That is, the disease was nine times more prevalent in West Thurrock than in the remainder of the Union. Comparing West Thurrock parish only with the other rural portions of the Union, the excessive prevalence is far more marked. Out of a population of 12,500 in these parishes there were only 8 cases, whereas, as we have seen, there were 39 cases amongst the population of 2,540 in West Thurrock, the proportion being 26 times greater in the parish opposite the ships. That the proximity of the ships was in some way the cause of this excessive prevalence I was convinced at the time of the outbreak; but, inasmuch as there was a certain amount of intercommunication between the ships and West Thurrock, there was left

room for doubt as to the mode in which the contagion was conveyed: a doubt which was taken advantage of by those who did not believe in the theory of aerial convection. As this intercommunication has been entirely cut off, the outbreak of small-pox in the Orsett Union, which commenced in September 1901, is well worthy of study. Many of the factors which have complicated the investigations of the prevalence of small-pox in the neighbourhood of other hospitals are practically absent, and the study is greatly simplified.

At the end of August the number of cases in the small-pox ships was 72, a greater number than had been under treatment at one time since the epidemic of 1894. The first case in the Orsett district was notified on or about this date, and the patient worked on the railway at Purfleet, at the nearest point to the hospital ships, but resided in Grays. The notifications since that date have been as under:—

	Grays Urban.	Orsett Rural.	Total for Orsett Union.	Total for Remainder of County.
1901—				
August	1	0	1	0
September	2	8	10	2
October	0	9	9	5
November	3	33	36	24
December	32	73	105	34
1902—				
January	55	74	129	99
February	35	59	94	94
March	29	30	59	206
Totals	157	286	443	464
Population, 1901 Census	13,831	19,890	33,721	782,803

In the eight months during which the disease has been prevalent in the county, the attack-rate per 1,000 inhabitants has been as under:—

			Ratio.
In Grays Urban District	11.4	...	19
In the Orsett Rural District	14.4	...	24
In the Orsett Union	13.1	...	22
In the remainder of the county . . . . .	.6	...	1

The ratio shows that small-pox during this epidemic, up to the end of March, has been 22 times more prevalent in the Orsett Union than in the remainder of the county, and that the incidence has been greater in the thinly-populated

rural portion than in the urban portion of that Union. Until last month (March), the disease did not show any tendency to become epidemic in any other district than Orsett, notwithstanding that it was being almost daily introduced from London, Dartford, and elsewhere, into the teeming population adjoining West Ham and the east and north-east of London.

Having demonstrated that the Orsett Union was the first part of the county to be invaded, and the only part as yet which has suffered from any epidemic prevalence, the distribution of the disease in the various parts of that Union may be considered. The district comprises eighteen parishes, the position of each relative to the hospital ships being shown on the map (p. 102).

The population and number of small-pox notifications from August, 1901, to April 1902, both inclusive, are given in the subjoined Table.

	Population.	No. of Cases Notified.
Aveley	1061	28
Bulphan	279	—
Chadwell St. Mary	4762	0
Corringham	817	4
East and West Tilbury	924	49
Fobbing	412	0
Horndon-on-the-Hill	568	0
Laindon Hills	233	0
Little Thurrock	1198	7
Mucking	464	0
North Ockendon	339	0
Orsett	1326	11
South Ockendon	1059	31
Stanford-le-Hope	1750	13
Stifford	1075	21
West Thurrock	2585	118
„ Garrison	215	0
„ Reformatory Ship	266	0
	<hr/>	<hr/>
	19,332	281
Grays Urban	13,831	157
	<hr/>	<hr/>
	33,163	438*

The most striking point in connection with this Table is that no less than 117 out of the 438 cases occurred in one parish (West Thurrock), and that that parish is the one nearest the hospital ships. This gives 117 cases amongst a

* The total number of cases, as notified to me monthly by the Medical Officers of Health, is 443, as given in the previous Table. This does not quite correspond with the detailed list with addresses furnished weekly, but the slight error is immaterial.

population of 2,585 against 321 in a population of 30,578. The attack rate per 1,000 population has been as under :

In West Thurrock	...	...	45
In the remainder of Orsett Union	...	...	10.5

or $4\frac{1}{2}$ times higher in West Thurrock than in the remainder of the district.

Most of the cases at Tilbury are directly traceable to personal infection, and the outbreak is one of the ordinary character. The patients are either dock labourers or members of their families, and the infection once being introduced into their crowded dwellings, the extension of the disease presents nothing remarkable.

West Thurrock, however, has a working-class population of a better character. It is a large parish, its area being 2,898 acres, giving more than 1 acre to each inhabitant, and from east to west extends for a distance of 3 miles. It is necessary, therefore, to further consider the distribution of the disease within the parish. The hospital ships are situated 700 yards from the nearest portion of the parish, and right opposite them is a small hamlet called Purfleet. This hamlet is exactly included in the three-quarter mile radius from the ships. Between this and the two-mile radius the population is very scattered and few in number, but just beyond this radius lies the village of West Thurrock.

The hamlet of Purfleet comprises 110 houses, chiefly cottages, and the population, according to a census taken by Mr. G. Sowden, M.R.C.S., my assistant, is 479. In Purfleet there have been 47 cases of small-pox, and in the remainder of West Thurrock (chiefly in the village 2 miles away) 70 cases. The attack-rate in the two portions is therefore as under :

In Purfleet hamlet	...	100 per 1,000 population
In West Thurrock village	...	33 " "

In other words, small-pox has been three times more prevalent in Purfleet than in the remainder of the district.

Just within and on the border of this three-mile radius lies also the populous portions of the parishes of Aveley and Stifford. In these parishes (about equally affected) have been 49 cases amongst a population of 2,136, giving an attack-rate of 23 per 1,000.

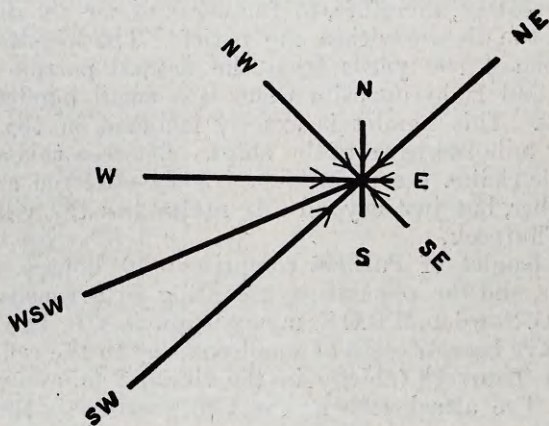
Between the third and fourth mile radius lies the town of Grays and village of South Ockenden. These together have a population of 14,890, and amongst this population there have been 188 cases of small-pox, equal to an attack-

rate of $12\frac{1}{2}$ per 1,000. Beyond this four-mile limit lies the remainder of the population of the Orsett Union, numbering 13,552, and amongst these there have only been 84 cases, equivalent to 6 per 1,000 population.

Summarized, the results obtained are as follows :

Attack-rate per 1,000 Population :			
Between the 700 yards and $1\frac{3}{4}$ mile radius	...	...	100
Between the $\frac{3}{4}$ mile and 3 mile radius—			
In West Thurrock	...	...	33.
In Aveley and Stifford	...	...	23.
Between the 3 mile and 4 mile radius	...	...	19.5
Beyond the 4 mile radius	...	...	6.

Strong as are these proofs of the effect of the proximity of the hospital ships, they can be further strengthened by a consideration of the effect of the prevalent winds. The wind rose appended shows that by far the most prevalent



winds during the past eight months have been from south-west and west-south-west, blowing from the ships over the south portion of Purfleet hamlet; hence, if the infection is carried by the air, we should expect to find that the great majority of the cases of small-pox would have been in South Purfleet. This is exactly what has occurred. West Purfleet has almost entirely escaped, whilst South Purfleet has been more than decimated. The two portions of this hamlet are entirely separate, the one lying to the west of the London, Tilbury, and Southend Railway, and the other to the south, the railway describing a curve equivalent to a right angle between the two parts, *vide* map. There is an interval of about quarter of a mile

between West and South Purfleet, upon which there are very few houses.

In West Purfleet, with a population of 137, there have been only 2 cases; whereas in South Purfleet, with a population of 342, there have been 45 cases.

Attack-rate in South Purfleet ...	...	131 per 1,000 !
West Purfleet ...	...	15 "

The statistical evidence in favour of there being some central focus of infection appears quite conclusive, and confirms the results of inquiries made by myself and assistants in the district concerned. I am convinced that there is no other factor than the presence of the hospital ships which can explain the above facts. The majority of the cases have occurred in the rural portion of the district, and the steps taken to prevent extension were fully as prompt and adequate as in other districts. That a considerable number of cases should occur in the block dwellings at Tilbury amongst the dock labourers, when once the disease had been introduced, is not a matter for surprise, but that there should be a continuous crop of cases—which has extended now over a period of eight months—in a small hamlet like Purfleet, and in spite of all the efforts of the sanitary authority advised by myself, and receiving the special attention of the Local Government Board, alone proves that there is some continuous focus of infection near, and this focus can only be the hospital ships of the Metropolitan Asylums Board.

It has been urged that the magnitude of the epidemic in the Orsett Union is not, save in a remote sense, to be attributed to the influence of the hospital ships. The extensive prevalence of small-pox which has occurred in Grays Urban District, in the village of Orsett, in Tilbury and in other parts of the Union some miles away from the ships, is said "rather to be referred, for example, to spread of the disease within households, or from person to person, or by unrecognised cases of small-pox; in other words, the causes which (as now in London) operate to maintain or multiply small-pox under circumstances in no way peculiar to the Orsett Union. And there can be no doubt that such agencies have also played a not-inconsiderable part in portions of the Union which may be regarded as possibly or probably exposed to opportunities of airborne infection from the ships, for instance, Purfleet and West Thurrock."* The writer quoted can scarcely

* From a Memorandum by Dr. Buchanan, Local Government Board, March 19th, 1902.

have fully informed himself of all the facts of the case as above recorded, otherwise it is inconceivable how he could have arrived at such a conclusion. No one denies that all the usual factors are operative; but why, if there is no unusual factor, have all the usual and most modern methods of arresting the spread of the disease utterly failed, even when applied in this thinly-populated district? How can the peculiar incidence of the disease—not only in this but in the preceding epidemic—be explained if the factor of the presence of the hospital ships is not of primary importance? I do not for a moment contend that all the persons attacked have been directly infected from the hospital ships. A large number of cases could be traced to direct personal infection, especially in the portions of the district more remote from Purfleet; but many of these could be ultimately traced to Purfleet. Again, it has been urged that the fact that no cases have occurred amongst the garrison at West Purfleet, or amongst the lads on board the training ship *Cornwall*, both within the $\frac{3}{4}$ -mile radius of the ships, prove that the infection is not air-borne. Certainly, at first sight, it does appear singular that these should have escaped, but the reason is very simple. The barracks lie to the extreme north of Purfleet, in the portion where only 2 cases of small-pox have occurred; but the immunity of the garrison is due, not so much to the position of the barracks, as to the fact that every inmate has been re-vaccinated, save a few who had had small-pox previous to the present outbreak. Until all had been re-vaccinated, residents inside the garrison were restricted in their communication with affected areas, but such restriction has now been removed. Major Angell informs me that there are now 224 persons resident inside the garrison. These persons are, therefore, all immunised, and had any cases occurred our surprise would have been great. On board the training ship there are 270 persons, all over 12 years of age. With reference to these, Rear-Admiral Morrell, the Superintendent, writes me as follows: "We go in strictly for vaccination and re-vaccination; but with regard to the staff I have not insisted on it, as I have no power to do this. But many of them have been re-vaccinated, and as most of my men are navy men, they have been re-vaccinated in the service, and my servants and family have all been re-vaccinated." Here, again, we have a community protected by re-vaccination, but probably not so completely protected as the garrison, as cases of small-pox have

occurred on board this vessel which could not be definitely accounted for. In one case a lad, who had not been off the ship for eight months, was attacked, and in the other case the patient was one of the staff.

The escape of the persons residing in the garrison and training ship is a very powerful argument in favour of re-vaccination, but has no bearing whatever upon the question of air-borne infection from the small-pox ships. Another attempted explanation of the excessive prevalence of small-pox in the Orsett Union is the laxity shown by the guardians in recent years in enforcing vaccination. Assuming this to be the case, it does not afford any explanation of the continued prevalence of the disease or of its peculiar distribution: a peculiarity which it must be remembered is common to the previous epidemic. This laxity on the part of the guardians has only been marked during recent years; and in the following Table, compiled from the reports of the Medical Officer to the Local Government Board, it will be found that this argument has very little weight. For comparative purposes I have included two other districts, because in character of population, etc., they resemble Orsett.

Number of Unvaccinated and Postponed Vaccinations per 1,000 Births.

—	1883-1887.	1887-1892.	1893.	1894.	1895.	1896.	1897.
Orsett ...	7.3	13.2	22.1	30.9	42.5	54.7	20.9
Rochford ...	4.1	8.7	19.8	21.5	24.5	30.8	35.7
Romford ...	6.0	14.6	13.9	20.3	19.8	22.6	24.8
County of Essex	—	11.7	16.8	18.5	18.9	21.3	25.8

The figures for the period 1898-1901 are not available. The above statistics show that for a few years vaccination was greatly neglected; and its bearing upon the present epidemic is shown by there being a preponderance of cases amongst children under 10 years of age, and by an unusually high proportion of cases being unvaccinated. This is actually the case, as is shown in the following Table:—

Persons Attacked with Small-pox.

	Under 10 Yrs. of Age.	10 Years and Over.	Total.	Percentage under 10.
Grays Urban ...	33	130	163	20
Orsett Rural ...	58	218	276	21
Other districts in Essex	60	315	375	16

Attacks amongst Children under 10 Years of Age.

	Vaccinated.	Unvaccinated.	Percentage Unvaccinated.
Grays Urban...	1	28	96½
Orsett Rural ...	7	28	80
East Ham and Walthamstow	20	35	63½

My statistics with reference to vaccination are very incomplete, but those included in the above table are, I think, reliable. In any case they demonstrate the importance of vaccination, and show that the susceptible portion of the population are most likely to be attacked even when the contagium is air-borne, which no one will be inclined to dispute. They also show that the general population in the Orsett Union was not adequately protected by vaccination; and it would be idle to deny that this fact would tend to increase the difficulty in stamping out the disease, but it is utterly inadequate to explain all the facts recited. The next Table, compiled from information obtained by Dr. Sowden when making a census for me at Purfleet, proves, however, that whatever may have been the condition of Orsett Union generally, the people living at Purfleet were probably as well vaccinated as in any hamlet in the county.

Statistics of Vaccination in Purfleet.

—	Vaccinated in Infancy only.	Vaccinated and since Re-vaccinated.	Not Vaccinated, but had Small-pox.	Neither Vaccinated nor had Small-pox.	Total.
Children Under 12 Years of age	70	106	2	7	185
Adults ...	110	171	8	4	294

There is nothing in this Table to account for 10 per cent. of the population having been attacked with small-pox during the past eight months.

As the result of my investigations, the conclusions arrived at are as follows:—1. That amongst the cases which occurred in Purfleet, both in the present and preceding epidemic, there were a large proportion which could not be traced to pre-existing cases. 2. That all the usual factors tending to produce epidemic prevalence of small-pox were present in the Orsett Union, with the addition of (save in the case of Purfleet) an unusually large proportion of unvaccinated children under 10 years of age. 3. That none

of these usual factors are capable of explaining the peculiar distribution of the disease during the epidemics investigated. 4. That all the results point to some central continuous focus of infection corresponding exactly in position with the small-pox ships. 5. That most careful inquiry fails to show any means whereby the continuous flow of infection can occur except on the hypothesis that it is air-borne.

Many important matters arise for discussion if the theory of the aerial convection of small-pox from hospitals is accepted, but time will not permit of my dwelling upon these at any length. Probably the most important is the question whether the danger arising from the proximity of a small-pox hospital can be avoided, and fortunately my experience in the Orsett district enables me to answer this in the affirmative. If every child under 10 has been vaccinated, and every person over that age re-vaccinated, there is practically nothing to fear. This is proved by the experience of the persons—over 500 in number—residing in the training ships and in the barracks at Purfleet, within the area in which the infection has been most intense. Amongst the inhabitants of South Purfleet only one re-vaccinated person has been attacked, and it is quite possible that in this case the re-vaccination, done five years previously, had not been satisfactory. Amongst the children under ten years of age in Purfleet, 6 have had small-pox, but of these 2 only had been vaccinated and 1 of these imperfectly, as only two faint and small marks could be discerned.

The extent of the area around a small-pox hospital which may be affected directly and indirectly by the hospital is apparently much larger than has hitherto been supposed. In the case we have been considering, the influence is probably being felt at a distance of fully three miles, and the presence of a belt of water half a mile in width is powerless to arrest the spread of the contagion.

There can be no doubt that the danger increases with the proximity to the hospital and with the increase of the number of acute cases under treatment, the infectivity not being marked until a certain degree of concentration is reached.

With a small hospital, say one constructed for from 10 to 20 or 30 cases, my impression is that there is but little danger of the disease being spread therefrom, providing the site is such as corresponds to the requirements of the Local Government Board; but the danger cannot be

said to be non-existent. With hospitals having a hundred or more beds, the danger is naturally much greater, and when we come to hospitals of the size of those required to cope with an epidemic in a large city the peril may be great indeed.

If the Government would learn the lesson taught by this epidemic, and render absolutely compulsory the vaccination of all infants and the re-vaccination of all children between the ages of 10 and 12 years, small-pox would speedily disappear, and hospitals for the isolation of patients suffering from the disease would no longer be necessary. Until this is done, authorities establishing hospitals outside their own districts might fairly be held responsible for all cases which occur within a certain area around, and for all other cases which can be directly traced to infection from the hospital. The only exceptions should be outbreaks which could be definitely traced to some other cause than the presence of the hospital. The aggregation of a large number of cases on a limited area is also, in my opinion, a danger to the patients themselves. They are surrounded by an intensely infected atmosphere, which must retard their recovery and tend to produce fatal results.

My idea of isolation on a large scale is the provision of permanent administrative buildings, and the scattering of the patients over a large area in properly constructed and equipped marquees. The erection of these during an epidemic would involve the employment of the minimum number of men and the expenditure of the minimum amount of money. An area like that of Canvey Island would serve for London, and probably the spreading out of the hospital over a large area, and the prevention of any concentration of the infection by using tents, none containing more than, say 40 patients, would more or less completely prevent the infection being air-borne, and so obviate the disastrous effects of the present arrangements. Schemes for cremating the infective material in the air from hospitals are, in my opinion, impossible of successful execution. Certainly none of the plans recently suggested to be my enthusiastic inventors and others are at all practicable.

APPENDIX.

SMALL-POX SHIPS, THAMES, 1884.

Fortnightly List of Admissions, Discharges, Etc.

1884.	Admissions.	Discharges.	Number under Treatment.
January	0	0	0
February 2 to 15*	—	—	42
February 15 to 28... ..	38	0	80
February 29 to March 13... ..	46	21	105
March 14 to 27	88	19	174
March 28 to April 10	85	113	146
April 11 to 25	115	117	144
April 26 to May 9	265	231	178
May 10 to 23	204	246	136
May 24 to June 6	396	416	116
June 7 to 20	510	412	214
June 21 to July 4	427	419	222
July 5 to 18	273	327	168
July 19 to August 1	136	200	104
August 2 to 15	118	98	124
August 16 to 29	82	112	94
August 30 to September 26	228	219	102
September 27 to October 10	168	185	85
October 11 to 24	266	247	105
October 25 to November 7	243	231	117
November 8 to 21	320	344	93
November 22 to December 5	407	353	147
December 6 to 19	334	303	178
December 20 to January 2 (1885)	290	279	189

* Ships re-opened.

71 cases occurred in the Orsett district during this year.

SMALL-POX SHIPS, THAMES, 1887.

Weekly List.

1887.	Admissions.	Discharges.	Number under Treatment.	1887.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	1	0	1	27th	—	—	—
2nd	0	0	1	28th	—	—	—
3rd	2	0	3	29th	—	—	—
4th	0	2	1	30th	—	—	—
5th	0	0	1	31st	1	0	1
6th	1	0	2	32nd	1	0	2
7th	0	0	3	33rd	1	0	3
8th	1	0	2	34th	1	2	2
9th	1	1	3	35th	1	0	3
10th	0	0	3	36th	1	0	4
11th	0	1	2	37th	0	0	4
12th	1	2	1	38th	1	1	4
13th	0	0	1	39th	0	2	2
14th	6	0	7	40th	2	1	3
15th	1	2	6	41st	1	0	4
16th	1	2	5	42nd	2	0	6
17th	1	1	5	43rd	5	1	10
18th	1	2	4	44th	4	2	12
19th	2	1	5	45th	1	1	12
20th	0	2	3	46th	3	1	14
21st	0	1	2	47th	0	3	11
22nd	0	0	2	48th	3	4	10
23rd	0	2	0	49th	3	5	8
24th	—	—	—	50th	2	1	9
25th	—	—	—	51st	0	4	5
26th	—	—	—	52nd	2	0	7

No cases occurred in the Orsett district during the year.

SMALL-POX SHIPS, THAMES, 1890.

Weekly List.

1890.	Admissions.	Discharges.	Number under Treatment.	1890.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	1	0	1	27th	0	0	1
2nd	0	0	1	28th	0	1	0
3rd	0	0	1	29th	—	—	—
4th	0	0	1	30th	—	—	—
5th	2	0	3	31st	—	—	—
6th	0	0	3	32nd	—	—	—
7th	3	1	5	33rd	—	—	—
8th	0	0	5	34th	1	0	1
9th	0	0	5	35th	0	0	1
10th	0	1	4	36th	0	0	1
11th	4	0	8	37th	0	0	1
12th	0	1	7	38th	0	1	0
13th	3	3	7	39th	1	1	0
14th	0	4	3	40th	—	—	—
15th	2	0	5	41st	—	—	—
16th	0	0	5	42nd	—	—	—
17th	1	3	3	43rd	—	—	—
18th	1	1	3	44th	—	—	—
19th	0	1	2	45th	—	—	—
20th	0	0	2	46th	—	—	—
21st	3	0	5	47th	1	0	1
22nd	1	2	4	48th	0	1	0
23rd	3	0	7	49th	—	—	—
24th	0	0	7	50th	—	—	—
25th	0	0	7	51st	—	—	—
26th	0	6	1	52nd	—	—	—

No cases occurred in the Orsett district during this year.

SMALL-POX SHIPS, THAMES, 1885.

Fortnightly List.

1885.	Admissions.	Discharges.	Number under Treatment.
January 3 to 16	350	295	244
January 17 to 30	489	415	318
January 31 to February 13	425	381	363
February 14 to 27... ..	289	377	275
February 28 to March 13... ..	186	246	215
March 14 to 27	235	330	120
March 28 to April 24	743	523	340
April 25 to May 8... ..	592	720	212
May 9 to 22	456	431	237
May 23 to June 5	410	462	187
June 6 to 19	335	309	224
June 20 to July 3	196	271	153
July 4 to 17	221	183	185
July 18 to 31	152	195	150
August 1 to 28	164	191	118
August 29 to September 25	216	182	154
September 26 to October 9	36	66	129
October 10 to 23	25	49	105
October 24 to November 6	31	39	97
November 7 to 20... ..	29	46	80
November 21 to December 4	23	29	74
December 5 to 18	21	26	59
December 19 to January 15 (1886)	22	41	40

144 cases occurred in the Orsett district during this year.

SMALL-POX SHIPS, THAMES, 1888.

Weekly List.

1888.	Admissions.	Discharges.	Number under Treatment.	1888.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	1	1	7	27th	1	0	3
2nd	3	4	6	28th	1	2	2
3rd	1	2	5	29th	1	1	2
4th	5	1	9	30th	0	0	2
5th	2	4	7	31st	1	1	2
6th	3	2	8	32nd	1	1	2
7th	0	3	5	33rd	1	0	3
8th	4	3	6	34th	0	0	3
9th	7	0	13	35th	0	1	2
10th	2	1	14	36th	0	2	0
11th	6	3	17	37th	—	—	—
12th	1	3	15	38th	—	—	—
13th	1	7	9	39th	—	—	—
14th	2	4	7	40th	—	—	—
15th	7	0	14	41st	—	—	—
16th	7	0	21	42nd	—	—	—
17th	3	3	21	43rd	—	—	—
18th	2	7	16	44th	—	—	—
19th	0	5	11	45th	—	—	—
20th	0	5	6	46th	—	—	—
21st	0	2	4	47th	—	—	—
22nd	0	1	3	48th	—	—	—
23rd	0	3	0	49th	—	—	—
24th	—	—	—	50th	—	—	—
25th	1	0	1	51st	—	—	—
26th	1	0	2	52nd	—	—	—

Four cases occurred in the Orsett district during this year.

SMALL-POX SHIPS, THAMES, 1891.

Weekly List.

1891.	Admissions.	Discharges.	Number under Treatment.	1891.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	1	0	1	27th	0	2	3
2nd	0	0	1	28th	0	1	2
3rd	0	1	0	29th	0	1	1
4th	—	—	—	30th	0	1	0
5th	—	—	—	31st	—	—	—
6th	—	—	—	32nd	—	—	—
7th	—	—	—	33rd	—	—	—
8th	1	0	1	34th	—	—	—
9th	0	1	0	35th	—	—	—
10th	—	—	—	36th	—	—	—
11th	2	0	2	37th	—	—	—
12th	1	0	3	38th	—	—	—
13th	5	1	7	39th	—	—	—
14th	0	0	7	40th	—	—	—
15th	9	1	15	41st	—	—	—
16th	5	1	19	42nd	—	—	—
17th	5	4	20	43rd	—	—	—
18th	13	1	32	44th	—	—	—
19th	7	4	35	45th	1	0	1
20th	3	8	30	46th	0	0	1
21st	1	6	25	47th	0	0	1
22nd	1	10	16	48th	0	0	1
23rd	2	11	7	49th	0	0	1
24th	0	3	4	50th	1	1	1
25th	0	1	3	51st	0	0	1
26th	3	1	5	52nd	2	0	3

No cases occurred in the Orsett district during this year.

SMALL-POX SHIPS, THAMES, 1886.

Weekly List.

1886.	Admissions.	Discharges.	Number under Treatment.	1886.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	2	9	41	27th	2	4	10
2nd	1	7	35	28th	3	5	8
3rd	11	11	35	29th	3	1	10
4th	2	11	26	30th	2	3	9
5th	4	8	22	31st	1	2	8
6th	1	5	18	32nd	2	2	8
7th	2	9	11	33rd	0	3	5
8th	2	3	10	34th	0	5	0
9th	7	2	15	35th	—	—	—
10th	0	8	7	36th	—	—	—
11th	1	1	7	37th	—	—	—
12th	2	2	7	38th	1	0	1
13th	5	4	8	39th	0	1	0
14th	4	1	11	40th	1	0	1
15th	3	1	13	41st	0	0	1
16th	6	3	16	42nd	2	1	2
17th	6	5	17	43rd	1	0	3
18th	3	1	19	44th	0	0	3
19th	11	3	27	45th	0	1	2
20th	9	5	31	46th	0	0	2
21st	10	6	35	47th	0	0	2
22nd	6	6	35	48th	0	2	0
23rd	4	14	25	49th	—	—	—
24th	8	5	28	50th	1	1	0
25th	2	9	21	51st	—	—	—
26th	1	10	12	52nd	1	0	1

No cases occurred in the Orsett district during the year.

SMALL-POX SHIPS, THAMES, 1889.

Weekly List.

1889.	Admissions.	Discharges.	Number under Treatment.	1889.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	—	—	—	27th	—	—	—
2nd	—	—	—	28th	—	—	—
3rd	—	—	—	29th	—	—	—
4th	1	0	1	30th	—	—	—
5th	0	0	1	31st	—	—	—
6th	0	0	1	32nd	—	—	—
7th	0	1	0	33rd	—	—	—
8th	—	—	—	34th	—	—	—
9th	1	0	1	35th	—	—	—
10th	0	0	1	36th	—	—	—

SMALL-POX SHIPS, THAMES, 1893.
Weekly List.

1893.	Admissions.	Discharges.	Number under Treatment.	1893.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	7	8	38	27th	64	70	149
2nd	21	4	55	28th	53	25	177
3rd	19	13	61	29th	52	28	201
4th	31	12	80	30th	29	40	190
5th	29	20	89	31st	35	94	131
6th	29	12	106	32nd	22	55	98
7th	40	15	131	33rd	23	37 (1)	84
8th	50	30 (1)	151	34th	20	15	89
9th	51	19 (2)	183	35th	8	23	74
10th	51	31	203	36th	23	14 (1)	83
11th	51	92	162	37th	19	10	92
12th	71	68	167	38th	18	25	85
13th	45	54 (1)	158	39th	15	29	71
14th	84	77 (2)	165	40th	14	9	76
15th	139	116 (1)	188	41st	17	13	80
16th	86	139	135	42nd	10	22	68
17th	107	63	179	43rd	24	14	78
18th	151	100	230	44th	30	5	103
19th	117	137 (1)	210	45th	48	25	126
20th	101	134 (1)	177	46th	17	21	122
21st	107	87 (1)	197	47th	20	37	105
22nd	100	103	194	48th	25	41	89
23rd	73	100	167	49th	22	60 (1)	51
24th	100	89 (3)	178	50th	21	12	60
25th	54	81	151	51st	21	18	63
26th	72	68	155	52nd	13	13	63

53 cases occurred in the Orsett district during the year.

SMALL-POX SHIPS, THAMES, 1896.
Weekly List.

1896.	Admissions.	Discharges.	Number under Treatment.	1896.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	9	16	67	27th	9	4	34
2nd	19	21	65	28th	9	3	40
3rd	10	8	67	29th	0	6	34
4th	12	15	64	30th	4	8	30
5th	11	7	68	31st	0	7	23
6th	6	15	59	32nd	2	8	17
7th	10	16	53	33rd	2	2	17
8th	4	5	52	34th	3	7	13
9th	1	8	45	35th	3	4	12
10th	11	10	46	36th	1	1	12
11th	4	10	40	37th	0	3	9
12th	7	5	42	38th	0	5	4
13th	2	11	33	39th	1	1	4
14th	0	12	21	40th	0	1	3
15th	2	3	20	41st	1	0	4
16th	1	9	12	42nd	0	2	2
17th	5	5	12	43rd	0	1	1
18th	1	3	10	44th	1	0	2
19th	2	2	10	45th	0	0	2
20th	5	0	15	46th	0	0	2
21st	4	2	17	47th	0	1	1
22nd	2	4	15	48th	0	0	1
23rd	6	2	19	49th	0	0	1
24th	5	4	20	50th	0	0	1
25th	15	2	33	51st	0	1	0
26th	6	10	29	52nd	0	0	0

7 cases occurred in Grays during the year.

SMALL-POX SHIPS, THAMES, 1899.
Weekly List.

1899.	Admissions.	Discharges.	Number under Treatment.	1899.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	1	0	1	27th	0	2	0
2nd	0	0	1	28th	0	0	0
3rd	0	0	1	29th	0	0	0
4th	0	1	0	30th	0	0	0
5th	0	0	0	31st	0	0	0
6th	0	0	0	32nd	0	0	0
7th	0	0	0	33rd	0	0	0
8th	2	0	2	34th	0	0	0
9th	0	0	2	35th	0	0	0
10th	0	0	2	36th	0	0	0
11th	0	1	1	37th	0	0	0
12th	0	0	1	38th	0	0	0
13th	0	0	1	39th	0	0	0
14th	0	0	1	40th	0	0	0
15th	2	0	3	41st	0	0	0
16th	0	0	3	42nd	0	0	0
17th	0	0	3	43rd	0	0	0
18th	0	3	0	44th	0	0	0
19th	0	0	0	45th	0	0	0
20th	1	0	1	46th	1	0	1
21st	0	0	1	47th	0	0	1
22nd	1	1	1	48th	0	0	1
23rd	0	0	1	49th	1	1	1
24th	1	1	1	50th	0	1	0
25th	0	0	1	51st	0	0	0
26th	1	0	2	52nd	0	0	0

No case in the Orsett district during the year.

SMALL-POX SHIPS, THAMES, 1894.
Weekly List.

1894.	Admissions.	Discharges.	Number under Treatment.	1894.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	12	17	58	27th	22	47	81
2nd	10	17	51	28th	14	19	76
3rd	11	11	51	29th	9	24	61
4th	15	14	52	30th	135	22	174
5th	18	6	64	31st	37	27	184
6th	11	15	60	32nd	24	33	175
7th	8	12	56	33rd	30	62	143
8th	15	15	56	34th	33	46 (1)	130
9th	10	9	57	35th	31	28	133
10th	19	17	59	36th	11	38 (2)	106
11th	7	11 (4)	55	37th	17	35	88
12th	9	13	51	38th	18	26	80
13th	10	13	48	39th	10	13	77
14th	20	9	59	40th	8	14	71
15th	24	15	68	41st	5	27	49
16th	55	8	115	42nd	10	16	43
17th	41	35	121	43rd	6	15	34
18th	57	25	153	44th	8	8	34
19th	65	51	167	45th	7	6	35
20th	49	37	179	46th	1	6	30
21st	65	40	204	47th	1	9	22
22nd	54	46	212	48th	5	6	21
23rd	36	53	195	49th	7	3	25
24th	36	58	173	50th	2	6	21
25th	18	52	139	51st	0	6	15
26th	14	47	106	52nd	1	0	16

14 cases occurred in the Orsett district during the year.

SMALL-POX SHIPS, THAMES, 1897.
Weekly List.

1897.	Admissions.	Discharges.	Number under Treatment.	1897.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	0	1	2	27th	—	—	—
2nd	1	0	3	28th	—	—	—
3rd	0	1	2	29th	—	—	—
4th	4	0	6	30th	1	0	1
5th	9	0	15	31st	0	0	1
6th	16	1	30	32nd	0	1	0
7th	3	3	30	33rd	—	—	—
8th	16	4	42	34th	—	—	—
9th	2	6	38	35th	—	—	—
10th	0	11	27	36th	—	—	—
11th	1	3	25	37th	—	—	—
12th	1	9	17	38th	—	—	—
13th	1	2	16	39th	—	—	—
14th	0	2	14	40th	—	—	—
15th	1	4	11	41st	—	—	—
16th	0	4	7	42nd	—	—	—
17th	3	1	9	43rd	—	—	—
18th	3	3	9	44th	—	—	—
19th	5	0	14	45th	—	—	—
20th	1	2	13	46th	—	—	—
21st	0	1	12	47th	—	—	—
22nd	0	8	4	48th	—	—	—
23rd	0	2	2	49th	—	—	—
24th	0	2	0	50th	—	—	—
25th	—	—	—	51st	—	—	—
26th	—	—	—	52nd	—	—	—

No cases in the Orsett district during the year.

SMALL-POX SHIPS, THAMES, 1900.
Weekly List.

1900.	Admissions.	Discharges.	Number under Treatment.	1900.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	1	0	1	27th	5	2	17
2nd	10	0	11	28th	2	3	16
3rd	3	0	14	29th	1	3	14
4th	4	0	18	30th	1	4	11
5th	0	3	15	31st	0	4	7
6th	1	5	11	32nd	0	2	5
7th	0	3	8	33rd	3	0	2
8th	2	0	10	34th	0	1	1
9th	2	5	7	35th	2	1	2
10th	1	1	7	36th	1	0	3
11th	2	4	5	37th	0	0	3
12th	0	0	5	38th	0	1	2
13th	0	2	3	39th	0	0	2
14th	0	1	2	40th	0	1	1
15th	2	0	4	41st	0	0	1
16th	0	1	3	42nd	0	0	1
17th	4	1	6	43rd	0	0	1
18th	0	0	6	44th	0	0	1
19th	0	1	5	45th	0	1	0
20th	0	2	3	46th	0	0	0
21st	3	1	5	47th	2	0	2
22nd	3	1	7	48th	0	0	2
23rd	4	0	11	49th	0	1	1
24th	6	4	13	50th	0	0	1
25th	1	2	12	51st	0	0	1
26th	5	3	14	52nd	0	0	1

2 cases occurred during the year in the Orsett district.

SMALL-POX SHIPS, THAMES, 1895.
Weekly List.

1895.	Admissions.	Discharges.	Number under Treatment.	1895.	Admissions.	Discharges.	Number under Treatment.
Week.				Week.			
1st	4	1	19	27th	14	8	39
2nd	8	2	25	28th	34	4	69
3rd	7	1	31	29th	21	4	86
4th	7	5	33	30th	109	8	187
5th	21	4	50	31st	58	87	158
6th	14	13	51	32nd	47	28	177
7th	16	2	65	33rd	76	67 (1)	186
8th	18	11	72	34th	60	88	158
9th	7	14 (1)	65	35th	35	55 (2)	138
10th	8	19	54	36th	24	22	140
11th	10	10	54	37th	37	47 (3)	130
12th	14	13	55	38th	21	42	109
13th	10	11	54	39th	19	25	103
14th	4	9	49	40th	16	29	90
15th	7	14	42	41st	9	29	70
16th	4	13	33	42nd	6	17	59
17th	11	10	34	43rd	55	6	108
18th	6	8	32	44th	23	34	97
19th	3	7	28	45th	10	35	