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Contributors

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REPORTS

ON

PUBLIC HEALTH AND MEDICAL SUBJECTS

No. 34

ERRATA.

Page iii. Footnote *re* Reports on Public Health and Medical Subjects.

No. 34 should read No. 33.

Page 13. Footnotes. For Report No. 34 read No. 33 in both cases.

)peration for
Breast



MINISTRY OF HEALTH.

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1926

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PREFATORY NOTE BY THE CHIEF MEDICAL OFFICER

To the Right Hon. NEVILLE CHAMBERLAIN, M.P.,
Minister of Health.

SIR,

One of the duties laid upon the Departmental Committee on Cancer* at its appointment was that of advising as to the best method of utilising the resources of the Ministry for the study of the problems the disease presents, and it was recognised that a powerful means to this end would be active co-operation with local health authorities throughout the country.

As an initial step in this direction in 1924 a Sub-Committee of the Departmental Committee was formed consisting of Medical Officers of Health of some of the larger County Boroughs in

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* This Committee, which was appointed in 1923 "to consider available information with regard to the causation, prevalence and treatment of cancer and to advise as to the best method of utilising the resources at the disposal of the Ministry for the study and investigation of these problems," consists of the following members :—

Sir George Newman, K.C.B., M.D., F.R.C.P. (Chairman).
C. J. Bond, C.M.G., F.R.C.S. (Hon. Consulting Surgeon, Leicester Royal Infirmary).
Sir George Buchanan, C.B., M.D. .. .. .. } Ministry
S. Monckton Copeman, M.D., F.R.C.P., F.R.S. .. } of
Major Greenwood, F.R.C.P. .. .. } Health.
Prof. Sir F. Gowland Hopkins, D.Sc., M.B., F.R.C.P., F.R.S. (Bio-Chemical Department, University of Cambridge).
Prof. W. S. Lazarus-Barlow, M.D., F.R.C.P. (late of Cancer Department, Middlesex Hospital).
J. A. Murray, M.D., F.R.S. (Imperial Cancer Research Fund).
T. H. C. Stevenson, C.B.E., M.D. (General Register Office).
S. Wyard, M.D., M.R.C.P. (The Cancer Hospital, Kensington).
Lt.-Col. A. B. Smallman, C.B.E., D.S.O., M.D. (Ministry of Health), Secretary.

Reports or Memoranda already issued, on the authority or advice of the Committee, include :—

Reports on Public Health and Medical Subjects :—
No. 28.—"Cancer of the Breast and its Surgical Treatment."
No. 32.—A further Report on "Cancer of the Breast with special reference to its associated antecedent conditions."
No. 34.—"A Report on the natural duration of Cancer."

Memoranda :—
(i) "Cancer."
(ii) "On the effects of Radium and X-Rays upon Normal and Cancerous Tissues."
(iii) "On Cancer of the Breast : The results of Treatment by Operation."
(iv) "On Experimental Cancer Research."

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England and Wales,* particularly those which contained a medical school or hospital. This Sub-Committee has rendered invaluable services in several directions, and particularly by organising local enquiries into the special questions under investigation.

As explained in previous reports, the Committee selected cancer of the breast as the first subject for intensive study. The first part of this study comprised an examination of the material recorded in home and foreign medical literature, the report on which emphasised two special points, viz., the value of the " complete " operation and the advantage gained by its performance at an early stage of the disease.† It was found, however, that the data available for analysis furnished insufficient information in certain directions where further knowledge was needed.

One question in particular required further elucidation, namely, the results of operation at a period longer than the usually adopted criterion of 3 or 5 years' freedom from recurrence. The Sub-Committee of Medical Officers of Health undertook to inquire into this subject in as many cities as practicable. The enquiry related to the subsequent fate of all patients operated upon for primary cancer of the breast in the main hospitals of the cities concerned during the two periods 1910–1913 and 1919–1921, the earlier period being selected to allow of assessing results at 10 years or more after operation, the later one to appraise those of more recent experience over a shorter period. The interval between 1913 and 1919 was eliminated because it was realised that, owing to the war, hospital records were likely to be so defective as to interfere with the validity of the investigation. A form of questionnaire was used, devised in such a way as to furnish data on the main point, and also on other somewhat subsidiary matters. In the cities concerned the enquiry was organised by the Medical Officer of Health acting either through a local cancer committee, when such was in existence, or directly in active and cordial co-operation with the staffs of the voluntary hospitals. The actual mode of enquiry used in the different cities varied somewhat and involved the

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* *Sub-Committee No. 5 (Medical Officers of Health).*
Sir George Buchanan, C.B., M.D. (Ministry of Health).
Philip Boobbyer, M.D. (Nottingham).
J. J. Buchan, M.D. (Bradford).
R. Veitch Clark, M.B. (Manchester).
D. S. Davies, M.D. (Bristol).
A. Mearns Fraser, M.D. (Portsmouth).
F. N. Kay Menzies, M.D., F.R.C.P. (London).
J. Johnstone Jervis, M.D. (Leeds).
Harold Kerr, O.B.E., M.D. (Newcastle-on-Tyne).
C. Killick Millard, M.D. (Leicester).
A. A. Mussen, M.D. (Liverpool).
R. M. F. Picken, M.B. (Cardiff).
Sir J. Robertson, C.M.G., O.B.E., M.D. (Birmingham).
F. E. Wynne, M.B. (Sheffield).

† Reports on Public Health and Medical Subjects. No. 28. Ministry of Health, 1924, " Cancer of the Breast and its Surgical Treatment," by Dr. Janet E. Lane-Claypon, M.D., D.Sc.(Lond.).

expenditure of much energy, care and patience, and to all those who thus assisted—members of the local committees, of hospital staffs, and special inquiry officers—our cordial thanks are due.

It was hoped that the enquiry would be completed in all the co-operating cities during the course of the year 1925, and it was intended in that event to examine and report upon the mass of material collected from all sources. Experience showed, however, that the difficulties encountered locally varied considerably and thus affected the time required for completing the investigation and drafting the reports. It was therefore decided to examine the first received, that from Leeds, in some detail in order to gauge the value of the information likely to be secured from the investigation as a whole. The opportunity for doing so was favourable since the Leeds report related to a considerable group (357) of cases, in an unusually small proportion of which (less than 5 per cent.) it had not been possible to follow out the histories of the patients. As a result of careful analysis of this material it was found, contrary I think to the belief of many surgeons as well as of the general public, that when patients undergo the complete operation at an early stage of the disease before it has spread from the breast, as high a proportion as 80 per cent. remain free from the disease ten years after operation. That this is not an isolated instance of an unusually favourable result is suggested by the facts that the cases analysed occurred in the practice of no less than thirteen different surgeons, and that subsequent to the receipt of the Leeds material, reports which have been examined, though in less detail, from five other cities point to the same conclusion.

The actual investigation in Leeds was carried out, under the auspices of the Leeds Cancer Committee of which Dr. J. Johnstone Jervis, the Medical Officer of Health, is Secretary, by a whole-time worker, Dr. Gretta M. Wardle, with the supervision of Professor Matthew J. Stewart. The analytical study of the material supplied was made on behalf of the Ministry and its Cancer Committee by Dr. Janet E. Lane-Claypon with the statistical advice of Dr. M. Greenwood.

Pending study and report on the whole of the material completed by the co-operating cities, it seemed that the important facts already elicited at Leeds should be made known as early as practicable. It is now possible through the courtesy of the Leeds Cancer Committee to present these data.

I am, Sir,

Your obedient servant,

GEORGE NEWMAN.

Whitehall,
June 1926.

THE LATE RESULTS OF OPERATION FOR CANCER OF THE BREAST (LEEDS)

Showing the After Histories of those Women Operated Upon for Primary Cancer of the Breast in the Leeds General Infirmary and the Hospital for Women and Children during the years 1910–1913 and 1919–1921.

INTRODUCTORY.

The following report deals, in a preliminary manner, with one portion of a collective investigation, instituted in several of the larger county boroughs, and designed to ascertain the results being obtained in England and Wales in the surgical treatment of cancer of the breast. The investigation here under consideration is unique. In no other published set of cases has there been made an attempt to follow a complete and consecutive series of patients as long as ten years after operation.

The after-histories of the patients and the results shown in the following pages are more complete, and hence more accurate, than is commonly the case in similar investigations. Only two cases of those domiciled in the city of Leeds were not traceable, and only eight of those domiciled outside the city. In a few instances the precise cause of death was not ascertainable, but in the vast majority the death certificate had been investigated and the recorded cause of death accurately obtained.

Experience has shown that it is erroneous to suppose that all cases not traced are dead. The very few cases in the present series in which the local inquiry had failed to obtain satisfactory information were referred to the Registrar-General for inquiry as to the occurrence of death or cause of death (if dead), so that the data for the whole series may be regarded as complete. This adds greatly to the value of the results, since it is not necessary to make any allowances for cases whose fate has not been ascertainable.

It may be noted that four cases were not traceable by the Registrar-General. It is therefore reasonable to assume that they were still alive in 1925. Two other patients were known to have died out of England, but the precise cause of death could not be ascertained. It has been assumed that these died of cancer. Two other women actually died of causes not cancer, but as a recurrence was present at the time of death, these also have been reckoned as deaths due to cancer.

*In all cases here under review there was a pathological report upon the primary growth establishing its malignant nature.**

It is proposed here to set out the results as concisely as may be consistent with a clear exposition of the subject matter, but without considering points of detail, however interesting, if these concern a few cases only. Other data of interest will be dealt with when the combined report on the other towns is published, since they are of a nature to require many cases for their satisfactory investigation.

It is convenient to divide the report into the following parts :—

I. The material investigated and the classification of the cases.
II. The age and civil state of the patients.
III. The alleged duration of the growth before operation, and other notes relating to it.
IV. The results of operation as found at three, five and ten years afterwards.
V. The survival rates of the patients.
VI. The deaths occurring among the patients from causes other than cancer.
VII. The method of operation employed.
VIII. Pathological notes.

PART I

The Material Investigated, and the Classification of the Cases.

The patients whose subsequent fate is recorded in the present report had been operated upon for the most part in the Leeds General Infirmary, but a few additional cases were obtained from the Hospital for Women and Children. In all, 357 cases are available, and these occurred in the practice of no less than thirteen different surgeons.

There were 145 patients domiciled within the city, and 212 patients domiciled outside the city at the time of operation, making a total of 357.

The two sets of cases were worked out completely separately in the first instance. It seemed not unlikely that the extra-mural cases might show points of divergence from those domiciled in the city, e.g., it seemed probable that those coming from greater distances might have postponed application for treatment until a later stage of the disease than those living nearer to the hospital. Actually no divergences of any importance were found ; on the contrary the results showed such close similarity as to suggest that each set forms a fair sample of the conditions obtaining for the population of that part of the country. Hence it is nowhere necessary to draw any distinction between the material derived from the two sources : it is treated as completely homogeneous.

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* Eleven cases of sarcomata and four endotheliomata are included. *See* Table 11.

It has been shown elsewhere that the duration of life after operation is greatly dependent upon the stage of the disease at the time of operation. Therefore it is important in considering results that all cases should be classified according to their condition at the time of treatment.

The classification adopted in the above-mentioned report was that of Steinthal,* but experience has suggested the advisability of some modification of this classification. In the present report the cases have been classified on the following basis :—

Class I. Cases in which, so far as could be ascertained, the growth was entirely confined to the breast, the axillary glands not being invaded.

Class II. Cases in which the axillary glands were already invaded but in which there was no evidence of involvement of any other neighbouring or distant organ or tissue.

Class III. Cases in which either the adjacent or distant organs or tissues were involved, e.g., the pectoral muscles, the skin when ulcerated, the cervical glands, the opposite breast, etc.

In a high proportion of cases there was no difficulty in assigning the cases to one or other of the above classes. In other instances the necessary data were either not complete or were entirely lacking.

In order to be satisfied as to the correct classification of cases as between Class I and Class II it is evidently desirable that both clinical and pathological findings should be available and that these should agree in showing whether involvement of the axillary glands was present or not. Glands clinically impalpable are often found to be involved at operation. Enlarged glands are not always cancerous, nor are small glands always free from invasion. The pathologist will usually cut that gland which appears to be the most likely to be invaded, but his finding, even if negative, does not necessarily mean that there has been no invasion of any gland.

In determining the classification, precedence was always given to the pathological findings. If this gave invasion of a gland the case was placed in Class II. If the pathological report was negative for cancer in the glands and if there was no contra-indication in the clinical data, even though these were defective, the case was placed in Class I.

Pathological examinations are not always practicable, as, for example, when the axilla is left unopened, also in instances in which no gland could be felt in the tissues removed, and hence could not be examined. Again, very early cases in which there

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* Reports on Public Health and Medical Subjects. No. 28. Ministry of Health, 1924, p. 51.

was only commencing malignancy have been entered as Class I in the absence of a pathological report on the glands. (*See* Table 2, Class I (*d*).)

A few cases, although the data were such as to suggest that the cases belonged to Class I but were defective in some particular, have been termed Class (?) I. It is possible that there may have been early invasion of the glands in some of these cases but the data were incomplete, those available being against this extension of the growth.

Doubtless also there are a few Class I cases amongst those in which the absence of data compelled them to be placed as "unclassified."

Distinction between Classes II and III depends chiefly upon data as to the extension of the growth to the muscles or to the skin or to some distant lymphatic glands. The distinctions are for the most part clinical in character. It is unfortunate that these data are frequently lacking so that there are 59 instances which have been entered as a Sub-Class (?) II because the glands of the axilla were definitely involved but there were no other data available to show whether or not the disease had extended further. The fate of these patients suggests that in fact a number of them must have been in a more advanced stage at the time of operation.

Hence both Classes I and II when the (?) classes are added are probably weighted by the inclusion of some more advanced cases.

Class III is weighted by the inclusion of some cases in which the growth could not be entirely removed. From the point of view of radical removal of the growth therefore these cases must be regarded not as undergoing a complete operation, but a palliative one only. These have not been separated in this report. On the other hand there is a small number of patients in whom the growth was found to be adherent to the muscles or in whom the skin was ulcerated but the axillary glands were not palpable, or the pathologist reports a negative finding in the glands. Since there was extension to tissues other than the axillary glands these have been placed in Class III, but the late results are rather more favourable than in the cases definitely belonging to Class III with invaded axillary glands, so that the total results in Class III are shown as rather unduly favourable owing to the inclusion of the patients just mentioned.

"Unclassified" cases are those in which the clinical and pathological data together were insufficient to enable any classification to be made.

The distribution of the cases, classified as just explained, is shown for each year of the period under review in Table 1. The difference between the percentage incidence of Class I cases in the two periods has been investigated, and it is found that the difference, having regard to the probable error, is so small as to be without significance.

TABLE 1.

Showing the distribution in each year, according to the condition at the time of operation.

Year.	Class I. (?) I.	Class II. (?) II.	Class III.	Un-classified.	Total.
1910 ..	9 2	7 7	5	7	37
1911 ..	9 4	4 7	11	3	38
1912 ..	12 2	8 9	11	10	52
1913 ..	8 2	9 8	13	4	44
Totals	38 10	28 31			
or together	48	59	40	24	171
1919 ..	12 3	7 13	16	6	57
1920 ..	4 7	11 7	18	11	58
1921 ..	7 6	19 8	26	5	71
Totals	23 16	37 28			
or together	39	65	60	22	186
Grand Total	87	124	100	46	357
Percentage of Classified cases :—					
1910–13 ..	32·7	40·1	27·2	—	—
1919–21 ..	23·8	39·6	36·6	—	—
All years	28·0	39·9	32·1	—	—

The nature of the clinical and pathological evidence utilised in the classification is shown in Table 2, and does not require comment.

TABLE 2.

Showing the nature of the evidence as to the condition of the axillary glands, upon which the classification was based.

	Class I.	Class II.	Class III.	Un-classified.	Totals.
(*a*) Clinical data only	30	16	35	8	89
(*b*) Pathological data only	15	23	7	1	46
(*c*) Both (*a*) and (*b*)	15	83	51	1	150
(*d*) Neither (*a*) nor (*b*)	27	2	7	36	72
Totals	87	124	100	46	357
Further details of (*c*):—					
Both data agree ..	14	66	36	0	116
Data disagree ..	1	17	15	1	34
	15	83	51	1	150

Disagreement occurred as follows :—

Class I.	Clinical data	+ ve :	pathological	− ve	1	case.
,, II.	,,	− ve	,,	+ ve	14	cases.
,, II.*	,,	+ ve	,,	− ve	3	,,
,, III.	,,	− ve	,,	+ ve	7	,,
,, III.†	,,	+ ve	,,	− ve	8	,,
Unclassified	,,	+ ve	,,	− ve	1	case
					34	cases

PART II

The Age and Civil State of the Patients.

As a matter of interest the age and civil state of the patients have been worked out. The results correspond so closely to those recently published‡ that it seems unnecessary to give them in detail.

The mean ages in the several civil states are given below, and the figures in brackets are those in the report referred to.

	Married.	Widowed.	Single.	Total.	
Mean age at operation ..	50·06	60·80	48·3	51·19	yrs.
,, ,, ,, ,,	(49·5)	(58·9)	(49·7)	(51·4)	,,
Percentage incidence ..	70·5	13·5	16·0		
,, ,, ..	(57·5)	(19·7)	(22·8)		

There is a higher proportion of married women among the

* One special gland only cut, apparently the highest axillary gland found.

† The growth was adherent, and the muscle or the skin ulcerated, or some other organ or tissue involved.

‡ Reports on Public Health and Medical Subjects. No. 32. Ministry of Health, 1926.

Leeds cases, but it is not likely that the difference has any significance. These percentages should not be taken as indicating any divergence from the mortality rates for cancer of the breast in England and Wales, which show that in proportion to the adult female population of the country single women are more commonly affected than married.

PART III

The Alleged Duration of the Growth before Operation, and Other Notes Relating to it.

The alleged duration of the growth before operation is shown for each class in Table 3.

TABLE 3.

Showing the alleged duration of the growth before operation according to the stage of the disease at operation.

Alleged duration.	Class I.	Class II.	Class III.	Un-classified.	Total.
Under 1 month ..	14	7	2	3	26
1—3 months ..	21	29	10	8	68
4—6 ,, ..	21	20	18	7	66
7—12 ,, ..	13	29	37	10	89
13—18 ,, ..	6	10	4	0	20
19—24 ,, ..	0	0	0	0	0
2 years	4	10	9	3	26
3 ,, ...	3	2	2	4	11
4 ,, ...	0	2	2	0	4
5 ,, ...	0	1	7	0	8
7 ,, ...	0	0	1	1	2
10 ,, ...	1	0	0	0	1
11 ,, ...	0	1	0	0	1
15 ,, ...	0	0	1	0	1
20 ,, ...	0	0	1	0	1
	83	111	94	36	324
No data ..	4	13	6	10	33
Total	87	124	100	46	357

Mean period for alleged duration of 5 years and under :—

	Yrs.	Mths.	Wks.	Days.		
Class I. ..	0	6	3	2	=	82 cases.
,, II. ..	0	9	2	0	=	110 ,,
,, III. ..	1	2	2	3	=	91 ,,

Mean period :—

All cases ..	1	0	2	4	=	324 cases.
Under 5 years	0	8	3	4	=	310 ,,
,, 3 ,,	0	7	1	6	=	295 ,,

It is evident that complete reliance cannot be placed upon some statements since the real duration of the growth in certain of the cases in Classes II and III must have greatly exceeded that given.

The mean alleged duration has been taken out for each class separately excluding those of duration over five years, because it is impossible to say whether these were malignant over such long periods.

The results are shown below Table 3. In the aggregate there is a sensible difference between the alleged durations in the several classes. Hence generally there is a definite relationship between the duration of the growth and the stage of the disease.

The side affected and the site of the growth in the breast have also been worked out. The results agree closely with those already obtained from the literature* and are therefore not repeated here. It is enough to state that there is little difference between the two sides in the incidence of the growth, and that the outer and upper part of the breast is that most frequently affected, the neighbourhood of the nipple being the next most common site.

PART IV

The Results of Operation as Found at Three, Five and Ten Years Afterwards.

The results have been taken out for three periods, namely three, five and ten years after operation, and are shown to the nearest month. All cases are available for the three year period, and all except those operated upon in 1921 have been used for the five year period. (There were a few cases operated upon in 1920 which had not been operated upon a full five years before the date of investigation. But of these, all except two had died, and the two who were alive presented no trace of recurrence or of metastases and had only a few months to complete the full five years after operation. It is reasonable, therefore, to suppose that they would not have died of cancer until after the expiration of the five years.)

All the cases in the period 1910–13 are available for the ten year period.

The results are tabulated in Tables 4, 5 and 6, respectively.

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* Reports on Public Health and Medical Subjects. No. 28. Ministry of Health, 1924.

Table 4.

Showing the fate of 357 patients operated on for cancer of the breast, at three years after operation. (1910-13 *and* 1919-21.)

Class.	(1) Number of cases.	(2) Alive at 3 years.	(3) Died of operation.	(4) Died of other cause.	Died of Cancer. Years after operation.			
					0–1	1–2	2–3	Total.
I ..	61	57	0	1	0	1	2	3
? I ..	26	21	1	2	0	1	1	2
Total ..	87	78	1	3	0	2	3	5
II ..	66	28	2	2	13	14	7	34
? II..	58	17	0	2	16	17	6	39
Total ..	124	45	2	4	29	31	13	73
III ..	100	28	6	4	28	22	12	62
Unclassified ..	46	23	3	2	7	5	6	18
Grand Totals	357	174	12	13	64	60	34	158

A.—Crude percentage of those alive at 3 years.

Class I	= 93·4	=89·6
,, ? I	= 80·8	
,, II	= 42·4	=36·3
,, ? II	= 29·3	
,, III	= 28·0	
Unclassified	= 50·0	
All classes	= 48·7	

B.—Percentage of those alive, after deducting the cases in columns (3) and (4)

= 95·0	=94·0
= 91·2	
= 45·1	=38·1
= 30·3	
= 31·1	
= 56·1	
= 52·6	

TABLE 5.

Showing the fate of 286 patients operated on for cancer of the breast, at five years after operation. (1910–13 *and* 1919–20 *inclusive.*)

Class.	(1) No. of cases.	(2) Alive at 5 years.	(3) Died of operation.	(4) Died of other causes.	Died of Cancer, Years after operation.					
					0–1	1–2	2–3	3–4	4–5	Total.
I ..	55	48	0	3	0	1	1	2	0	4
? I ..	19	15	1	1	0	1	0	0	1	2
Total ..	74	63	1	4	0	2	1	2	1	6
II ..	47	12	2	2	8	11	6	5	1	31
? II	50	6	0	3	16	15	4	4	2	41
Total ..	97	18	2	5	24	26	10	9	3	72
III ..	74	10	4	4	22	18	7	4	5	56
Unclassified	41	11	3	2	6	5	6	4	4	25
Total ..	286	102	10	15	52	51	24	19	13	159

A.—Crude percentage of those alive at 5 years.

Class I = 87·3 } = 85·1
,, ? I = 79·0 }
,, II = 25·5 } = 18·5
,, ? II = 12·0 }
,, III = 13·5
Unclassified = 26·8
All classes = 35·7

B.—Percentage alive after deducting the cases in columns (3) and (4).

= 92·3 } = 91·3
= 88·2 }
= 27·9 } = 20·0
= 12·8 }
= 15·1
= 30·6
= 39·1

TABLE 6.

Showing the fate of 171 *patients operated on for cancer of the breast at ten years after operation.* (1910-13.)

Class.	(1) No. of cases.	(2) Alive at 10 years.	(3) Died of operation.	(4) Died of other causes.	Died of Cancer. Years after operation.							
					0–1	1–2	2–3	3–4	4–5	5–7	7–10	Total.
I ..	39	30	0	6	0	1	1	1	0	0	0	3
? I ..	10	5	1	2	0	1	0	0	0	1	0	2
Total ..	49	35	1	8	0	2	1	1	0	1	0	5
II ..	28	2	2	3	5	7	3	2	0	3	1	21
? II	30	1	0	1	7	11	3	3	1	1	2	28
Total ..	58	3	2	4	12	18	6	5	1	4	3	49
III ..	40	2	2	2	13	12	2	2	1	4	0	34
Unclassified	24	4	3	3	3	4	4	2	1	0	0	14
Grand Totals	171	44	8	17	28	36	13	10	3	9	3	102

A.—Crude percentage of those alive at 10 years.

Class I	= 76·9	71·4
,, ? I	= 50·0	
,, II	= 7·2	5·2
,, ?II	= 3·3	
,, III	= 5·0	
Unclassified	= 16·6	
All classes	= 25·7	

B.—Percentage of those alive after deducting the cases in columns (3) and (4).

= 90·9	87·5
= 71·4	
= 8·7	5·8
= 3·4	
= 5·5	
= 22·2	
= 30·1	

If a comparison be made between them certain points are at once evident.

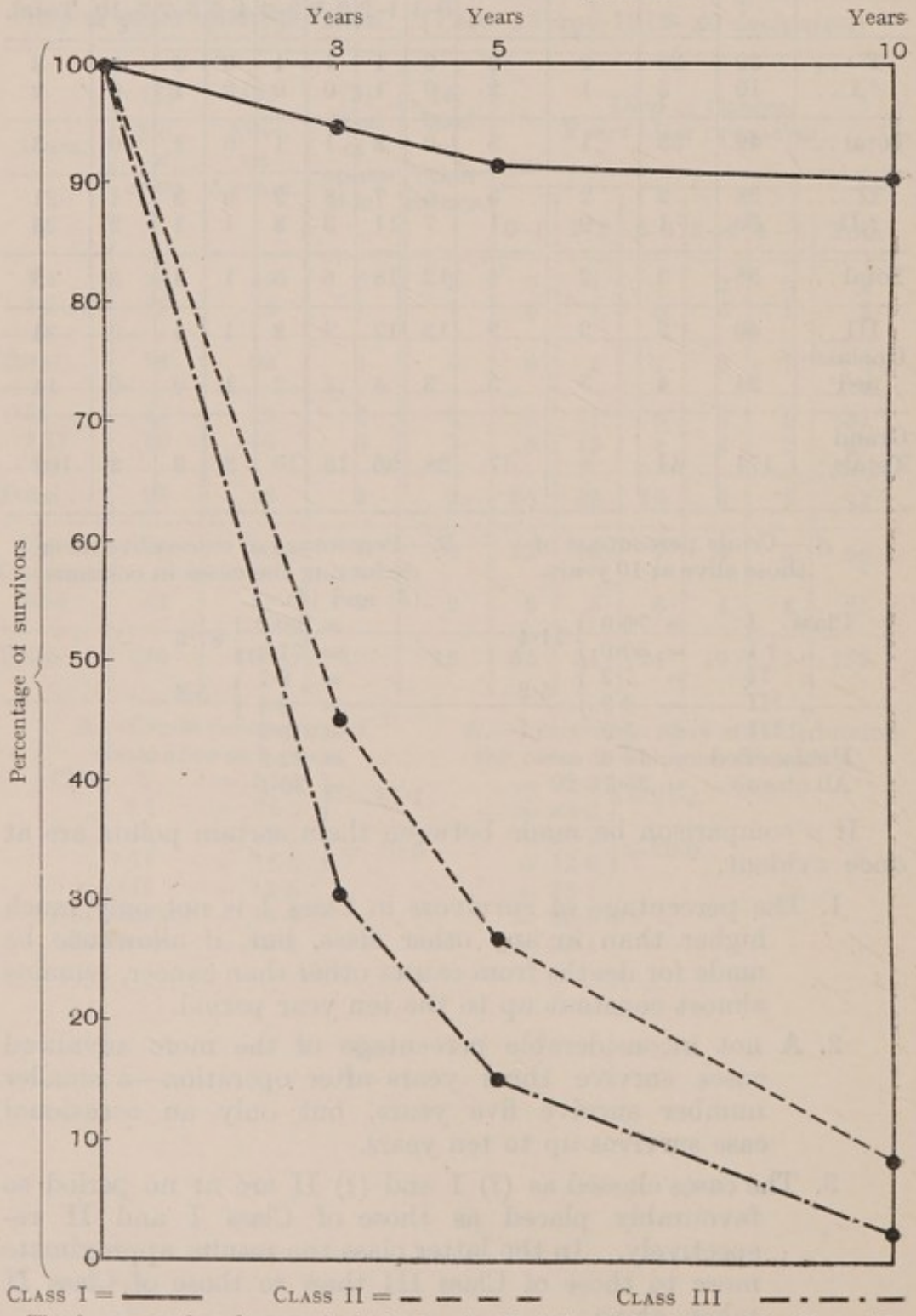
1. The percentage of survivors in Class I is not only much higher than in any other class, but, if allowance be made for deaths from causes other than cancer, remains almost constant up to the ten year period.
2. A not inconsiderable percentage of the more advanced cases survive three years after operation—a smaller number survive five years, but only an occasional case survives up to ten years.
3. The cases classed as (?) I and (?) II are at no period so favourably placed as those of Class I and II respectively. In the latter class the results approximate more to those of Class III than to those of Class II taken alone.

4. General end results obtained by adding all cases together without reference to their classification are misleading in giving both an unduly unfavourable result for early cases and a too favourable one for more advanced cases.

The percentage of survivals is shown in the form of a curve for each class in figure 1.

FIGURE 1.

Showing the percentage of survivors at 3, 5 and 10 years, according to the stage of the disease at operation.



The figures are based on method of reckoning B of the tables 4, 5 and 6. Classes ?I and ?II are omitted.

The wide divergence between the late results of Class I and other classes is at once apparent. In this figure the (?) cases in each class have been omitted. Their addition makes little difference but causes a further approximation of Classes II and III, and a slight drop at ten years in Class I.

The late results in Class I are extremely favourable and the period of freedom from disease is of such duration as almost to justify the term "cure," in the ordinary acceptance of the term. They should do much to dispel that pessimistic attitude so frequently manifested in relation to the operative treatment of cancer of the breast, not only among the population at large, but also among members of the medical profession.

PART V

The Survival Rates of the Patients.

With the object of effecting a summary comparison, the rates of mortality have been expressed in life table form, that is to say, the numbers of survivors from a constant (1,000) number of entrants at the end of one, two, etc., years from operation have been determined. Table 7 shows the results of such a calculation (*a*) for the Class I cases, (*b*) for all the cases. With these are contrasted (*c*) the survivorship of untreated cases (natural duration), (*d*) that of the general female population, taking age 55 as the entering age, and Life Table No. 8 (experience of 1910–12) as the standard. A rough measure of the arithmetical reliability of the figures is afforded by the "standard errors." As the figures for natural duration were deduced from what is, virtually, a record of deaths, they should, theoretically, somewhat understate the true durations, but there is good reason to believe that this under-statement is slight, so that the columns of the table are, paying attention to "standard errors," fairly comparable. It will be noted that from the third year onwards even the unanalysed series (all classes) which includes so many unfavourable cases, is vastly superior to the "natural duration" experience.* The results of Class I cases are somewhat of a revelation. At the end of 10 years from operation upon a growth definitely proved to be malignant, the number of survivors is within 14 per cent. of that provided by a general population table.† It is, we submit, impossible to regard this result without feelings of the deepest satisfaction. It fully vindicates the opinions of Halsted and other surgeons who have taught that early and complete operation in malignant disease of the breast might be one of the triumphs of surgery. The satisfaction is only tempered by the regret that so small a proportion of patients do, in fact, reach the operating table at this stage.

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* cp. Reports on Public Health and Medical Subjects. No. 34, Ministry of Health, 1926. A Report on the Natural Duration of Cancer, p. 18, table 5.

† It will be seen that these results are considerably more favourable than those given in Report No. 34, which were derived from the literature (see Report No. 28).

TABLE 7.

The number of survivors after operation compared with that of untreated cases (Natural Duration), and with the experience of Life Table No. 8.

	(*a*) Class I only.	(*b*) All classes.	(*c*) Natural duration.	(*d*) Life Table No. 8.
	(87)	(357)	(651)	
*l*0	1,000	1,000	1,000	1,000
*l*1	966 ± 19·6	773 ± 22·2	831 ± 14·7	984
*l*2	943 ± 25·0	591 ± 26·0	553 ± 19·5	967
*l*3	897 ± 32·7	487 ± 26·4	344 ± 18·6	949
*l*4	826 ± 40·9	397 ± 26·0	238 ± 16·7	930
*l*5	826 ± 40·9	357 ± 25·8	161 ± 14·4	910
*l*6	783 ± 45·9	321 ± 25·8	120 ± 12·7	889
*l*7	766 ± 48·1	278 ± 25·9		867
*l*8	746 ± 50·6	267 ± 26·0		843
*l*9	707 ± 55·1	246 ± 26·0		819
*l*10	687 ± 56·9	235 ± 25·9		794

PART VI

The Deaths Occurring among the Patients from Causes other than Cancer.

Deaths from operation and from causes other than cancer require some notice. The deaths from operation preponderate among the advanced cases as is shown in Table 4. The death which occurred in Class ? I was that of an extremely obese patient. Details of the deaths are shown in Table 8. Several of the patients were afflicted with diseases of other nature as well as with the cancer, and were, therefore, bad subjects for operation.

TABLE 8.

Deaths due to operation and to causes other than cancer.

Class.	Cause of death.	Period after operation.	Age at death.
A.—*Deaths due to operation.*			
? I	Fatty heart or fat embolism	1 day	59
II	Cardiac dilatation	27 days	63
II	Cardiac disease	2 ,,	66
III	Chronic interstitial nephritis	same day	47
III	Cerebral hæmorrhage, gallstones, early granular kidney and fibroid uterus	2 days	60
III	Shock	2 ,,	43
III	General septicæmia, and suppurative cholecystitis	2 weeks	63
III	Interstitial nephritis and arterio-sclerosis ..	2 ,,	68
III	Empyema and pneumonia	3 ,,	48

TABLE 8—*continued.*

Class.	Cause of death.	Period after operation.	Age at death.
Unclassified.	Rupture of the axillary artery. P.M. metastases and T.B. in bronchial glands..	3 weeks	56
,,	Suppuration, cirrhosis of liver, atheroma of aorta and necrotic fibroid of uterus.. ..	4 ,,	67
,,	Sepsis after operation	4 ,,	54
	Total cases 12		
B.—*Deaths due to causes other than cancer of the breast.*			
I	Acute pneumonia: cardiac failure	11 years	58
I	Acute nephritis	2½ ,,	52
I	Heart failure suddenly in street. No clinical evidence of secondaries	3¼ ,,	61
I	Cancer of rectum	3½ ,,	52
I	Died of operation for a recurrence of a supposed simple tumour, actually carcinoma, P.M. No metastases	5 ,,	49
I	Valvular disease of the heart. No recurrence	7¾ ,,	70
I	Senile decay	8¾ ,,	76
I	Influenzal pneumonia	8¼ ,,	73
I	Old age	12¼ ,,	88
I	Old age and cerebral degeneration	14¾ ,,	75
I	Bronchitis	15 ,,	73
I	Heart failure and old age	11 ,,	71
? I	Morbus cordis	½ ,,	66
? I	Morbus cordis. (3 days' illness.)	2½ ,,	71
? I	Cerebral softening and paraplegia	¾ ,,	59
? I	Phthisis, no recurrence or metastasis.. ..	3–4 ,,	52
? I	Influenzal pneumonia	9¼ ,,	49
? I	Cancer of uterus. No mammary recurrence..	11½ ,,	60
II	Valvular disease of heart. No recurrence ..	1¾ ,,	43
II	After operation for submucous fibroid and cholelithiasis. No recurrence	6½ ,,	52
II	Acute desquamative nephritis..	4 ,,	44
II	Acute bronchitis	1¾ ,,	83
II	Pericarditis and peritonitis. No recurrence	10½ ,,	58
? II	Bright's disease. No recurrence	1¼ ,,	57
? II	Cerebral apoplexy after injury	2½ ,,	58
? II	Nephritis	3¾ ,,	56
III	Phlebitis, cystitis and septicæmia. No recurrence or metastasis found	4 ,,	68
III	Leptomeningitis	½ ,,	66
III	Heart failure	¾ ,,	61
III	Melancholia	7 ,,	58
III	Bronchitis, erysipelas, and heart failure ..	¼ ,,	58
III	Stokes Adams' disease	2 ,,	53
Unclassified.	Pneumonia. (6 days illness.)	20 months	59
,,	Chronic bronchitis: neuritis and syncope ..	4 years	61
,,	Cerebral hæmorrhage	7¾ ,,	61
	Total cases 35		

The deaths from causes other than cancer are shown in detail in Table 8, and number 35 in all. In no instance was there any recognised recurrence or metastasis from the breast. Among those given are two patients who died of cancer of other parts of the body, namely, the rectum and the uterus. These are not sites in which metastases from cancer of the breast occur at all commonly, if ever. No pathological report is available as to the nature of the cancer which caused the death of the patient, so that its association with, or independence of, the mammary cancer cannot be established with any certainty. Although this is the case they have been placed as "other causes" partly to draw attention to them, and also because other similar cases occur in the material from other towns. They do at least suggest the possibility of the formation of a second primary growth when the first growth has been completely removed. As both the cases occur in Class I there is reasonable ground for the assumption that all the primary growth was removed. The uterine cancer occurred 11½ years after the removal of the breast cancer.

The total number of deaths from other causes is somewhat in excess of the number which might be expected normally to occur in a population having a mean age of 52 years. This suggests, as has also been shown in Part V, that to some slight extent cancer patients are damaged lives even if the cancer be removed entirely.

PART VII

The Method of Operation Employed.

The prevailing practice among the Leeds surgeons is the performance of Rodman's operation, or occasionally Halsted's. No attempt has been made to distinguish between these. Both have been taken as "complete." All other procedures in which the muscles were not removed and the axilla carefully cleared out have been reckoned as "incomplete." Among the cases in the period 1910–13 are a number—chiefly early cases—in which two operations were performed. The first one was usually a removal of the growth itself or perhaps of the breast. When the pathological report showed that the case was malignant the surgeon performed the complete operation, usually a few days, or rather later, after the first operation. In the later period, if there was doubt as to the malignancy an incision was made at the time of the first part of the operation and a decision as to procedure reached at once.

The number of operations other than complete is so small that it hardly seems of any value to attempt to make a comparison between the results of the different methods. This matter will receive further attention in the larger report to be presented later. The figures for three years are shown in Table 9, and the subsequent fate of those still alive at the three year period of Table 9 is shown in Table 10.

TABLE 9.

Showing the results of operation after three years, in relation to the method of operation.

Class.	Result.	Method of operation.			
		Complete.	Two operations.	Incomplete	Total.
I	Alive ...	50 = 94·3%	13	14	77
	Died of Cancer	3	0	2	5
	Total ..	53	13	16	82
II	Alive ..	42 = 39·2%	1	1	44
	Died of cancer	65	3	3	71
	Total ..	107	4	4	115
III	Alive ..	24 = 32·4%	1	2	27
	Died of cancer	50	1	11	62
	Total ..	74	2	13	89
Unclassified.	Alive ..	17 = 54·8%	3	3	23
	Died of cancer	14	2	2	18
	Total ..	31	5	5	41
All Classes	Alive ..	133 = 50·2%	18	20	171
	Died of cancer	132	6	18	156
	Total ..	265	24	38	327

Method of operation doubtful	5
Died of operation or of other cause under 3 years	25
	357

The figures in this table for operations other than the complete one cannot be taken as an argument in favour of incomplete operations of any form.

Owing to the basis of classification adopted—combined clinical and pathological—the figures only show that *if* the disease has been entirely removed by an incomplete operation the patient may survive. They do not indicate that if there is clinically no enlargement of the glands of the axilla this part need not be cleared. Moreover the numbers are too small to be of value for statistical purposes.

TABLE 10.

COMPLETE OPERATION.—*Showing the subsequent fate as known in 1925 of the 133 patients shown alive in Table 9. (Figures in brackets above the line denote a recurrence or a probable recurrence.)*

Years after operation.	Alive in classes :—					Died of cancer in classes :—					Died of other causes in classes :—					Totals in classes :—				
	I.	II.	III.	Unclassified.	Total.	I.	II.	III.	Unclassified.	Total.	I.	II.	III.	Unclassified.	Total.	I.	II.	III.	Unclassified.	Total.
3–4	(1)(?1) 2	3	3	0	8 (1921 cases)	0	9	4	4	17	3	2	0	0	5	5	14	7	4	30
4–5	4	(2) 8	(?1) 3	(1) 3	18 (1920 cases)	1	3	4	2	10	0	1	1	1	3	5	12	8	6	31
5–6	7	1	(?1) 2	1	11 (1920 and 1919 cases)	0	3	1	2	6	0	0	0	0	0	7	4	3	3	17
6–7	7	2	0	2	11 (1919 cases)	1	3	3	0	7	0	1	1	0	2	8	6	4	2	20
7–8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1
8–9	0	0	0	0	0	0	3	0	0	3	2	0	0	0	2	2	3	0	0	5
9–10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1
10–11	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	1	1	0	0	2
11–12	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1
12–15	(2) 17	2	2	1	22 * (1910–13 cases)	0	0	0	1	1	2	0	0	0	2	19	2	2	2	25
Totals	37	16	10	7	70	3	21	12	9	45	10	5	2	1	18	50	42	24	17	133

* The cases operated between the years 1913–19 were not investigated.

PART VIII

Pathological Notes.

It seemed of interest to take out the data relating to the primary growth. It has already been explained that this was given for all cases in the series. No attempt has been made to offer details of the end results in relation to the nature of the growth, this being reserved until more data are available for study.

The data are shown in Table 11.

TABLE 11.

A statement of the pathological findings as to the primary growth.

Pathological report. Variety of cancer.	No. of cases.	Class I.	Class II.	Class III.	Unclassified.
Spheroidal-celled :—					
(*a*) Very cellular ..	84	18	37	20	9
(*b*) No special note ..	105	13	43	39	10
Scirrhus	78	17	27	21	13
Scirrhus and encephaloid in parts	3	0	2	1	0
Adeno-carcinoma ..	35	19	7	6	3
Columnar carcinoma ..	3	0	0	1	2
Spheroidal and columnar	3	1	1	1	0
,, and Adeno-carcinoma	9	2	3	3	1
Colloid	4	3	1	0	0
"Carcinoma" ..	8	0	0	6	2
"Early malignant change"	10	10	0	0	0
Sarcomata	11	3	1	2	5
Endotheliomata ..	4	1	2	0	1
Totals	357	87	124	100	46

It may be noted that there are a number of cases (21·4 per cent.) of very cellular carcinomas in Class I, a class in which the results have been shown to be extremely favourable. This suggests that it is the stage of the disease rather than the nature of the growth that is of importance. Evidently it is likely that the more active growths will spread at a greater rate. This, however, will receive detailed consideration later, when more cases are available.

SUMMARY.

A general figure showing the total number of survivors at any given period after operation, regardless of the stage at which

treatment is undertaken does not furnish a true test of the potential value of the radical operation.

The extreme importance of undertaking the complete operation while the growth is still confined to the breast is demonstrated; given these conditions it is rare for a patient to die of the disease within 10 years of the operation. On the other hand, it is the exception for one undergoing similar treatment after the growth has ceased to be local, to be alive 10 years after operation.

Or, expressed in percentages we have :—

Class I.	Growth still local. 90·1% *alive* at 10 years after operation.
Class II.	Axillary glands involved. 91·3% *dead* within 10 years of operation.
Class III.	More advanced cases. 94·4% *dead* within 10 years of operation,

so that the survival rate is inverted as soon as the cancer has passed beyond the breast.

Further it is calculated for Class I cases that at the end of 10 years from operation upon a growth definitely proved to be malignant, the number of survivors is within 14% of that provided by a general population table.

These results are at once a challenge to pessimism and a stimulus to efforts to secure operative treatment at the earliest possible stage of the disease.

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REPORTS

ON

HEALTH AND
AL SUBJECTS

No. 35.

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nistrative Aspects of
arlet Fever.

urrent English public health practice
reatment of Scarlet Fever prepared
by

C. PARSONS, M.R.C.S.
of a Committee of Medical Officers
Ministry of Health)

hed, in large part, by Medical Officers
erintendents of Isolation Hospitals.



MINISTRY OF HEALTH.

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PREFATORY NOTE BY THE CHIEF MEDICAL OFFICER.

The Right Hon. NEVILLE CHAMBERLAIN, M.P.,
Minister of Health.

SIR,

1. I have the honour to present a Report on the "Administrative aspects of Scarlet Fever." This is essentially a stock-taking Report which records the result of an inquiry into our present administrative position as regards one of the most familiar of the ordinary infectious diseases.

2. Scarlet Fever, though no longer the fatal and terrifying disease it once was in England, is still very common among us. The following figures show the number of cases and deaths certified during the last ten years :—

Year.	Cases notified (excluding non-civilians).	Deaths (including non-civilians).
1917	48,817	768
1918	48,180	1,020
1919	82,398	1,221
1920	119,490	1,430
1921	137,073	1,305
1922	108,242	1,382
1923	85,603	993
1924	84,654	888
1925	91,362	988
1926	81,672	677

This return indicates at once the wide prevalence and relatively low mortality which at the present time characterise scarlet fever. A glance at the chart facing page 4 makes it clear that from 1838–1880 scarlet fever was a very mortal disease, but that in recent years, in spite of its frequent incidence, the death rate has steadily diminished to small proportions. The disease appears among us annually as the winter season approaches, causing serious interference with the education of children and with the daily social life of the homes infected. Moreover, it is an expensive malady, for the treatment and isolation of the vast number of patients affected involves the expenditure of much public money. Here then is the case for inquiry, and for full and careful reconsideration as to whether our administrative machinery is as effective as it should be.

3. It will be obvious that each of the great infectious diseases which prevail in England, such as smallpox, scarlet fever, diphtheria, influenza, measles or tuberculosis, present their own

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special problems. All infective disease is not the same disease. Each malady must be studied and dealt with separately, though there may be features common to all. Now, in regard to scarlet fever, there are three groups of problems. First there is its cause, which though not yet fully ascertained, is receiving continued investigation by many workers in this country and abroad. Secondly, there is the large and promising field of immunity, a problem which in differing degree concerns all infective processes, and in which, as we shall see, substantial progress is being made towards new knowledge which is already applicable in practice. Thirdly, there is a whole group of practical questions in regard to practical administration day by day. We cannot afford to wait, and do not in fact wait, until we know the cause of a disease before we begin to grapple with it. Tuberculosis has been fought for generations, but it was not until 1881 that Koch discovered the cause. Early in the nineteenth century this country had to control cholera to escape the calamity of cholera controlling us; yet its origin was not determined until Koch isolated the bacillus in 1883. Smallpox, likewise, has been grappled with and mastered since the eighteenth century, yet we do not even now know its bacterial cause. In the same way we have had to deal with scarlet fever, though we lack accurate or final knowledge as to its *causa causans*.

It was learned long ago by experience that scarlet fever was infectious from person to person, hence the necessity of isolating the sick from the healthy; it was found, too, that segregation must be organised in hospitals as it could not be effectively supervised, controlled or directed in the home of the patient; the approximate period of isolation was determined by the physical state of the patient, and the probable degree of his infectiousness; empirically it was assumed that infection was conveyed by materials handled by the patient, by his clothing, or by the house in which he lived, hence disinfection; as time went on medical knowledge grew in regard to the particular channels of infection, whether personal or environmental, certain parts of the patient's body apparently retaining infection longer than other parts, and in respect of his environment the relation of school attendance or the milk supply to the spread of infection; then it was learned that in scarlet fever, as in other infective processes, there are changes in virulence, now severe, now mild; lastly, we are acquiring knowledge as to "carriers" of infection, and as to ways and means of immunizing the susceptible part of the population so that they shall not contract the disease. Clearly, our administrative procedures have changed as our knowledge develops and as we are learning the correct answers to many practical questions. As time passes mere isolation seems less important, mere disinfection (with chemicals) of the surroundings of the patient less necessary. We cannot, however, say that the principle of isolation can be abandoned, because we are faced with the fundamental and undisputed truth that scarlet fever is an

infectious complaint. Nor can we discard disinfection, if as seems certain we are dealing with an infection. But both isolation and disinfection require from time to time to be re-examined, not in principle but in method, in time, in kind, and in means of application. It is this occasion, this situation, which has led to the inquiry of which this document is the report.

4. It may be convenient for me to say at once that the present Report does not deal with the two major problems of the cause of scarlet fever or of the immunization against the disease, except in quite an incidental way. The subject of the Report is some of the practical administrative aspects of scarlet fever, and the inquiry has been carried out, I think appropriately, by a Committee of the Medical Officers of the Ministry with the co-operation of Medical Officers of Health throughout the country, and of Medical Superintendents of nearly 60 fever hospitals, to all of whom I should like to express our appreciation and indebtedness. Thus, the inquiry has been concerned with the manner in which scarlet fever is spread, with the nature and efficacy of the measures carried out in hospitals or at home for the care of the patient, with the control of the disease, and with disinfection in relation to scarlet fever. These subjects, however, proved all-sufficient for the time and opportunities at our disposal ; the information received, indeed, provoked so many interesting subsequent inquiries that the publication of the report has been unavoidably delayed beyond the time of its appearance as originally planned. The report which is now submitted is divided into four main parts, the particulars of which will be seen by a glance at the contents table.

5. In submitting the Report it is appropriate that I should offer a few explanatory remarks on the more important issues here raised. In the first place there is the question of the *isolation hospital* in relation to scarlet fever. Isolation hospitals for patients suffering from infectious fever were designed to separate the infected persons from the rest of the community. It was the safeguarding of the non-infected that was the principal aim, and as the incidence of infectious disease changed from time to time, patients suffering from different diseases filled the wards. The historical origin of this device dates back a thousand years to the ninth century when pest houses and lazarettos were founded. In modern times the amenities have, of course, improved in accordance with social ideas, but the principle of segregation, the complete separation, of the infectious sick from the healthy has continued, first, for leprosy and the Black Death, then for ague and sweating sickness, and later on for typhus, smallpox, cholera, enteric fever, diphtheria and scarlet fever. Then, as medical knowledge increased, the *treatment* of the isolated patient became more practicable and therefore more customary, and mere isolation became a secondary aim. A third change has occurred in the modern practice of municipal fever hospitals, though its origins

also belong to ancient history. A *social factor* has emerged. The isolation of the patient has been demanded as a "right" or sometimes even as a form of poor relief or social assistance; or, the condition and circumstances of his home have necessitated isolation in hospital if his sickness was to be effectually dealt with; or again, the limitation of accommodation in fever hospitals, with other administrative circumstances, has lead to medical officers adopting a rule that only certain diseases, to wit, smallpox, diphtheria, scarlet fever and enteric fever should be removed to hospital. The present position, therefore, is that a sort of preferential advantage in regard to hospital isolation has been attached to these four diseases. In the meantime, there has been a profound change in the incidence and rate of mortality of infectious disease. Enteric fever has almost disappeared, and scarlet fever and smallpox have, for the time being at least, appeared in a mild form, calling for less stringent or prolonged hospital treatment. On the other hand, measles, pneumonia, and infectious diseases of the nervous system have assumed a proportionately graver aspect. In 1917–1926 there were, as we have seen, 10,672 deaths from scarlet fever, but there were 58,292 deaths in the same decennium from measles, 392,942 deaths from pneumonia, and 13,645 from epidemic diseases of the central nervous system. Clearly, the occasion requires a re-consideration of the use to which isolation hospitals are put by the Local Authorities. *Admission to hospital must have closer regard to the incidence and severity of disease in the locality.* The twofold function of the infectious diseases hospital, treatment and isolation, is one in purpose, namely, the diminution of disease and the improvement of the public health. Therefore, the criterion of admission to hospital should not be an assumed common "right" of infected persons, still less a form of poor relief, but it should be *the nature and degree of the malady*, as regards both the patient and the community. In a word, the medical officer who admits to hospital must *select* the cases which are in all respects suitable for the treatment and isolation provided by the Authority, and in doing this he will have regard to (*a*) the disease in question and to the prevalence of disease generally, (*b*) the condition of the patient, and (*c*) the circumstances of the patient's home.

6. The administration here suggested is already being adopted by some Local Authorities. For instance, Dr. Dunstan Brewer, Medical Officer of Health of Swindon, reported in 1923, as follows:—

> "The policy which I have advocated throughout, and which the Board has recognised, is to render the hospital as valuable as possible by increasing the number of different infections which can be accommodated. Though it has always been the practice to utilise the hospital for infections other than scarlet fever, diphtheria and enteric fever upon occasions, the definite principle that the hospital is there for the purpose of the treatment of other infections has not

been recognised until recently. The principle once recognised, matters can be left to develop until the hospital really becomes the centre where infectious diseases of all kinds are normally treated. The throwing open of the hospital for the treatment of diseases other than those which were originally contemplated has had marked benefit upon the public health of the district, and has been a material help in producing the satisfactory position in which Swindon stands as regards the incidence and the fatality of infection."

In carrying out this policy, Dr. Brewer may be said to have adopted the practice suggested above, and he has admitted to hospital not only patients suffering from the usual infectious diseases, but also those affected with measles, whooping cough, pneumonia and puerperal fever. Much the same practice has been adopted for several years past at Birmingham (Dr. Harries), at Hornsey (Dr. Prior), at Newcastle-on-Tyne (Dr. Kerr), at Wallasey (Dr. Barlow), and other places, and apparently with excellent results. More recently the Metropolitan Asylums Board, after prolonged consideration and some years of investigation, have decided to modify their arrangements in order to afford patients suffering from measles a considerable proportion of the beds hitherto reserved for scarlet fever.

7. Such changes in practice bear, of course, a direct relation to the question of the routine isolation of patients suffering from scarlet fever. If only selected cases of scarlet fever be admitted to hospital, instead of 75-85 per cent. of all cases of scarlet fever, a substantial amount of accommodation will become available for patients suffering from some of these other diseases I have mentioned. Further, if such uncomplicated cases of scarlet fever as are admitted are retained in hospital for a shorter period than hitherto, that also will relieve the accommodation of unnecessary occupation. Both of these modifications are obviously dependent upon hospital administration, modes of medical treatment, criteria of discharge, social circumstances of the patient, and other collateral matters, which receive attention in the Report.

8. In the second place there is the large subject of disinfection, concerning which opinion has also undergone considerable modification in recent years. Its object is the destruction of the *materies morbi*, the infecting micro-organisms or their vehicle, and the articles and surroundings contaminated by such infective agents. The aim has been to destroy or to prevent transmission of infective agents, either in the body of the patient or in his clothing or surroundings. At first it was a pursuit of the specific organism only. It was sought to keep this seed of disease from attacking persons in contact with the patient, or if too late to achieve that purpose it was hoped to kill the organism on invasion, or render it innocuous. Hence the home was fumigated by sulphur and the clothing was " stoved " or soaked in disinfectant. Again, the throat in scarlet fever or diphtheria was sprayed, the enteric fever patient swallowed intestinal disinfectant, and the skin of the smallpox patient was fomented with antiseptics.

All this was rational and has been, and is, in varying degree effective. But it is not enough. Closer work, finer adjustments, better materials and more thorough technique are necessary, even in respect of the methods of external disinfection. Above all, attention must be given to (i) the strengthening of the resistant powers of the human body, (ii) the direct treatment of all foci of infection, and (iii) the large question of immunization, for in these directions we may find an answer to infection much more enduring and effectual than chemical disinfection or steam. Immunization, natural or acquired, is the biological answer to disease.

9. Thus, it will be seen that disinfection raises numerous collateral issues, and the purpose of disinfection itself must be revised as well as its methods. There is " current " disinfection of the body of the patient, his clothes and immediate personal environment during treatment and at its conclusion ; and there is " terminal " disinfection of his house and domestic articles and utensils. To discard either of these purposes would at present be unwise, though the methods of cleansing or disinfecting the body or the environment call for continual revision and vigilance. A vast quantity of popular " disinfection " which goes on at present is not only entirely ineffectual but wasteful and absurd. To conceal one bad smell by creating another is not disinfection. And as I have already hinted, we appear to be making substantial advances in our knowledge of the serological circumstances of scarlet fever which may well lead to profound administrative changes in both isolation and disinfection for this disease. There can be little doubt that (*a*) the proper application of the new knowledge of the relation of ear and throat conditions to infective processes, (*b*) the use of barrier-nursing, ample cubic capacity and floor space, and open-air treatment in fever hospitals, and (*c*) the adoption of the Dick test and artificial immunity, are likely to contribute to the steady improvement of our whole administrative organisation for dealing with scarlet fever.

10. Finally, as regards the result of the inquiry, the report shows that in the majority of districts the measures at present in use for the control of scarlet fever, and for the treatment of the patient, follow traditional lines. There is, of course, nothing in the data received to suggest that the administrative machinery for the control of scarlet fever has been responsible by reason of any inherent flaw for the continued prevalence of the disease. But there is a considerable amount of evidence which suggests that parts of this machinery have failed to achieve the direct purpose for which they were created, namely, the effective prevention of the spread of scarlet fever. Thus, owing to the mildness of the present type of the disease, many cases are not diagnosed sufficiently early to make their notification, and subsequent isolation, of much value from a public health point of view. More disappointing still is it to learn that the exceptionally high rate of cases admitted to isolation hospitals which to-day

obtains, is not associated with a corresponding lowered incidence rate of the disease in the country as a whole. Again, the Committee are not satisfied that the longer a patient stays in hospital the less chance is there of his giving rise to "return" cases. Further, it is evident that many reporters are troubled with doubts concerning the usefulness of much that belongs to the traditional routine of disinfection after scarlet fever. This does not mean that present methods are, or have been, useless, but rather that they have not been either adequately organised or suitably applied. The prevalent practice, in many large towns, of removing nearly all notified cases of scarlet fever to hospital has developed not through public health exigencies, but through social and traditional circumstances. Overcrowding in the smaller homes, and the fear of hampering the occupation and movements of the various wage-earners in the family, are evidently material reasons why so few cases of scarlet fever are nursed at home. Nevertheless, the Committee conclude that, under present conditions and on general public health grounds, too many beds in fever hospitals are being reserved for scarlet fever patients; and that some of these beds could be more profitably used for the isolation and treatment of patients suffering from infectious diseases of more importance than scarlet fever at the present time. In regard to disinfection it is suggested that methods need modification, and that "current" or bedside disinfection of the patient appears to the Committee to be more satisfactory in principle and likely to prove more effective in practice than the so-called "terminal" disinfection of the home, as generally carried out. It is to be hoped that notification may become more complete, and perhaps more sensitive as a result of the aids to diagnosis which recent bacteriological studies seem to promise.

11. The Inquiry may, I think, be said to have brought together an extremely valuable body of facts, experience and competent opinion, much the largest in quantity and most serviceable in quality that has hitherto been collected. It is precisely this sort of survey which is conducive to a fuller study and consideration in every sanitary district of the country of the measures necessary for the control of scarlet fever in the new circumstances of to-day, circumstances which differ in many ways from those existing when isolation hospitals were first established. It is expedient that the mass of facts and opinions collected and analysed by Dr. Parsons should be allowed to speak for themselves, and therefore the conclusions have been stated in provisional, tentative and guarded form. The immediate object of the report is to open the subject and not close it. The time is not ripe for universal action, it is more than ripe for careful reconsideration and closer study. Whilst the data of the report appear to point definitely in one direction or another, the accuracy and reliability of some of these local materials may well be too insecure and unstable in validity for general or national application. Few local health authorities are in a position to furnish reliable

returns over a sufficiently long series of years. The report endeavours to make the best of such data as were available. A practice or tradition in regard to a particular disease all too readily becomes established, fixed and static; yet in view of their purpose and growth, scientific measures of disease-prevention continually call for critical re-examination as to their truth and necessity, and for vigilant re-consideration from the point of view of the legitimacy and expediency of the expenditure incurred.

I have the honour to be,

Sir,

Your obedient Servant,

GEORGE NEWMAN.

Whitehall,

April, 1927.

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SOME ADMINISTRATIVE ASPECTS OF SCARLET FEVER

PART I—INTRODUCTION

A. Historical.

The early history of scarlet fever, as of most diseases, is obscure. Nearly 50 years ago, in his classical treatise, Hirsch (60) remarked that under the Arabic term *hasba*, usually rendered into mediæval Latin as *morbilli*, might well have been included not only what we now term measles but various exanthematous disorders; he thought that the chief constituent of the group, other than measles, was scarlet fever. Creighton (29) pointed out the ambiguity of the word *measles* itself in English medical usage, and Richter, who reviewed, in a scholarly paper (105) the relevant Arabic and Arabist* literature, reaches essentially the same conclusion as Hirsch, viz., that cases of what *we* should term scarlet fever were familiar to the Arabian physicians and also to European practitioners in the Middle Ages.

In modern times, the first clear account of the exanthem was given by Ingrassia of Palermo in 1550, whose description is quoted textually by Haeser (53), in his account of *Rossania*, which he specifically distinguished from *Morbilli*. Ingrassia likened the eruption to an erysipelas and used the vigorous image that the whole body seemed, as it were, on fire (totum corpus ignitum appareat). He implies that the disease was sometimes deadly, but does not refer either to throat symptoms or dropsy. In his account of the epidemic constitution of 1574 Ballonius (3) distinguishes *Morbilli* and *Rubeolae*, and finally, in 1627, Döring, of Breslau, reached what we should now regard as an adequate conception of clinically typical scarlet fever which is given in full in the works of his father-in-law, D. Sennert.† This author describes the eruption in much the same terms as Ingrassia—whom he cites—but, not only does he describe the desquamation, he also deals specifically with graver forms of the disease (malum vero hoc grave ac periculosum et saepe lethale est), refers to throat complications (faucium et aliorum viscerum inflammationes) and late dropsy (tandemque abdomen intumescit aegrique non sine magno labore et post longum tempus pristinae sanitati restituuntur, saepe etiam moriuntur). Sennert (or Döring) classifies the disease with *Morbilli*, as did Morton, and, to this extent, may be said to

* i.e. the works of the mediæval copyists of the Arabians.

† See Richter, op. cit., pp. 182–4 and Haeser, op. cit., pp. 422–4.

have fallen short of Sydenham, whose account of *Febris Scarlatina*, first published in the third edition of the *Observationes Medicae* in 1676 (119) has, perhaps, been somewhat over-praised. From the clinical point of view, both Sennert and Döring gave a better account of the disease, as subsequently experienced, than did Sydenham; perhaps because their experience corresponds more closely than did that of Sydenham to the clinical and epidemiological types which invested scarlet fever with such importance both for the physician and public health administrator in more recent days. In spite of Sydenham's immense prestige, the *name* scarlet fever did not become universally current for some time. Diemerbroeck, however, in 1685* speaks of a disease similar to measles called by the Dutch *roodjonck*, *roodhont* and *rootgront*, and Sibbald in 1684† speaks of a new disease, which is called *scarlatina*, from the carmine colour with which almost the whole skin is tinged, and named *scarlet* in the vernacular.

Throughout the 18th century there is, clinically, recognition of Sydenham's scarlet fever, or *scarlatina simplex*, and a good deal of confusion between what came to be called scarlatinal angina and malignant angina. Roughly speaking, the latter corresponds to modern diphtheria and the former to the severer type of scarlet fever commonly observed in the middle of the 19th century, but the task of deciding whether such or such an epidemic were *really* scarlet fever or diphtheria, has baffled the most competent historians and even induced one of them to question the validity of any such distinction.‡

From what has been said, it follows that while we can be confident that scarlet fever was an illness frequently observed during at least a century before Sydenham's day and may fairly suspect that it came under the observation of physicians long before that, its *epidemiological* history is much more conjectural. Most, indeed, who, a century ago, published a laborious history of scarlet fever (92) has tabulated many epidemics in the 17th century, but his identifications are very dubious and a detailed criticism of them would carry us far beyond the limits of this introduction. Even in the 18th century, for the reasons mentioned above, the historical record is not easy to interpret. But that record is certainly sufficient to justify the conclusions of Hirsch on three very important epidemiological propositions. The first is that, in comparison with measles, scarlet fever has occurred much more rarely *as an epidemic* and has exhibited epidemic cycles which are either irregular or of a periodicity not yet determined. A corollary of this is, in Hirsch's words :—" Another thing peculiar to the manner of appearing of scarlatina, which distinguishes it from measles; the latter occurs almost solely as an epidemic, the isolated cases of measles being either its forerunners or its scattered offshoots persisting for a time; whereas *sporadic cases*

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* See Richter, op. cit., p. 188.
† See Creighton, op. cit., Vol. II., p. 681 and Richter, op. cit., p. 188.
‡ See Creighton, op. cit., Vol. II., p. 679.

of scarlatinal sickness, in large numbers or small, have been observed a good many times."

The third and most conspicuous peculiarity of all is the variation in the intensity of the disease. Even if we ignore the evidence of the first half of the 18th century (and, *a fortiori*, that of earlier times) the change of type of scarlet fever after the last years of the 18th century and the extreme gravity of the disease at that epoch are proved by many records. Willan's reports on the diseases in London in the years 1796–1800 (134) contain numerous references to the gravity of scarlet fever. Thus he writes (May, 1797): "Since the beginning of May, the scarlatina anginosa has become more frequent than any other contagious disease, both in town and in many parts of the country; the disease has generally occurred in its malignant and fatal form, which, at this season of the year, is very unusual" (op. cit. p. 202), and again, in November, 1798, "The fatal cases of scarlatina were in the month of November, when the disease was more extended, and more virulent than any period within my recollection since the years 1786, 1787" (op. cit. p. 274). Much similar evidence exists.

Within a few years, however, there was a change. Bateman (5) made reports on the diseases of London from 1804 to 1816 similar to those of Willan, and although he frequently refers to scarlet fever, once only (in the autumn of 1815, when he says that the "scarlet fever was generally accompanied by a severe affection of the throat") does he imply that the disease was severe. Thus, in the autumn of 1807, "the scarlatina was generally mild, presenting the eruption accompanied with a slight sore throat" (op. cit. p. 91). In 1908: "The contagion of scarlet fever has been very active; we have seldom seen the disease find its way into a family, without attacking all the younger branches, who were liable to it, and some of the adults. Yet the symptoms have been generally moderate, insomuch that only *one* patient in the above list,* a child three years old, died." (Op. cit. p. 108.) In 1808–9: "The scarlet fever has been less prevalent, and of the same mild type as described in the former report" (op. cit. p. 114). 1809: "The scarlet fever has been prevalent among children, nearly to the same extent, and with the same moderate symptoms, as mentioned in the last Report" (op. cit. p. 118). Autumn, 1814: "The measles and scarlet fever have been very prevalent; and the former, in a few cases, were attended with considerable affections of the chest. The scarlatina has been, in all the cases, accompanied by sore throat; in the adults, indeed, in two or three families, the throat, as is usual, was the only seat of the disease, as the rash did not appear on the skin. Under cool treatment, which, however, is often very imperfectly accomplished in the close and crowded apartments of the poor, these cases have uniformly done well." (Op. cit. p. 250–1.)

To these reports again parallels can be found pointing to the general mildness of scarlet fever between the first years of the

* The list includes 36 cases of scarlatina anginosa.

century and (in Great Britain) the third decade. After 1830, scarlet fever rapidly became what it continued to be through more than a generation, " the leading cause of death among the infectious maladies of childhood."*

After the establishment of General Registration of Deaths (by the Act of 1836), it became possible to compute rates of mortality from scarlet fever, but the old confusion between malignant angina or malignant cynanche and the scarlatinal angina prevents the earlier returns from being strictly comparable with more recent data. There is, however, no doubt that the mortality properly chargeable to scarlet fever was very great during the first twenty years of registration and continued to be very great for the next 30 years. A maximum of recorded mortality was reached in the year 1863, when the rate upon persons of all ages was 1,478 per million living and upon persons under 15 years, 3,966. This was the absolute maximum, but almost as high a level was attained in 1864 (1,418 per million living) and in 1870 (1,446 per million living). (See Chart 1, opp.)

The scale of the mortality at this epoch is well shown by a series of tables in the Supplement to the 35th Annual Report of the Registrar-General (the last of Farr's decennial reviews). Of 1,000,000 live-born children, 175,410 died before completing the 5th year of life ; of these deaths scarlet fever was responsible for 11,373, whooping cough for 9,650, measles for 5,257, and diphtheria for 4,184, in the *Healthy Districts* (*i.e.* Registration Districts specially chosen because of their relatively low general rates of mortality). In England and Wales, as a whole, the number of deaths under five out of 1,000,000 born was 263,182, and of these 17,959 were due to scarlet fever. In the Registration District of Liverpool (statistically, the most unhealthy district in the country) the total deaths were 460,370, those due to scarlet fever, 26,818.

After 1870, mortality from scarlet fever began to decrease and, with the exception of the year 1870, when it was at the rate of 1,050 per million living, never again reached 1,000 per million. After 1882 the rate never exceeded 500 per million, and since 1906 it has not exceeded 100 per million.

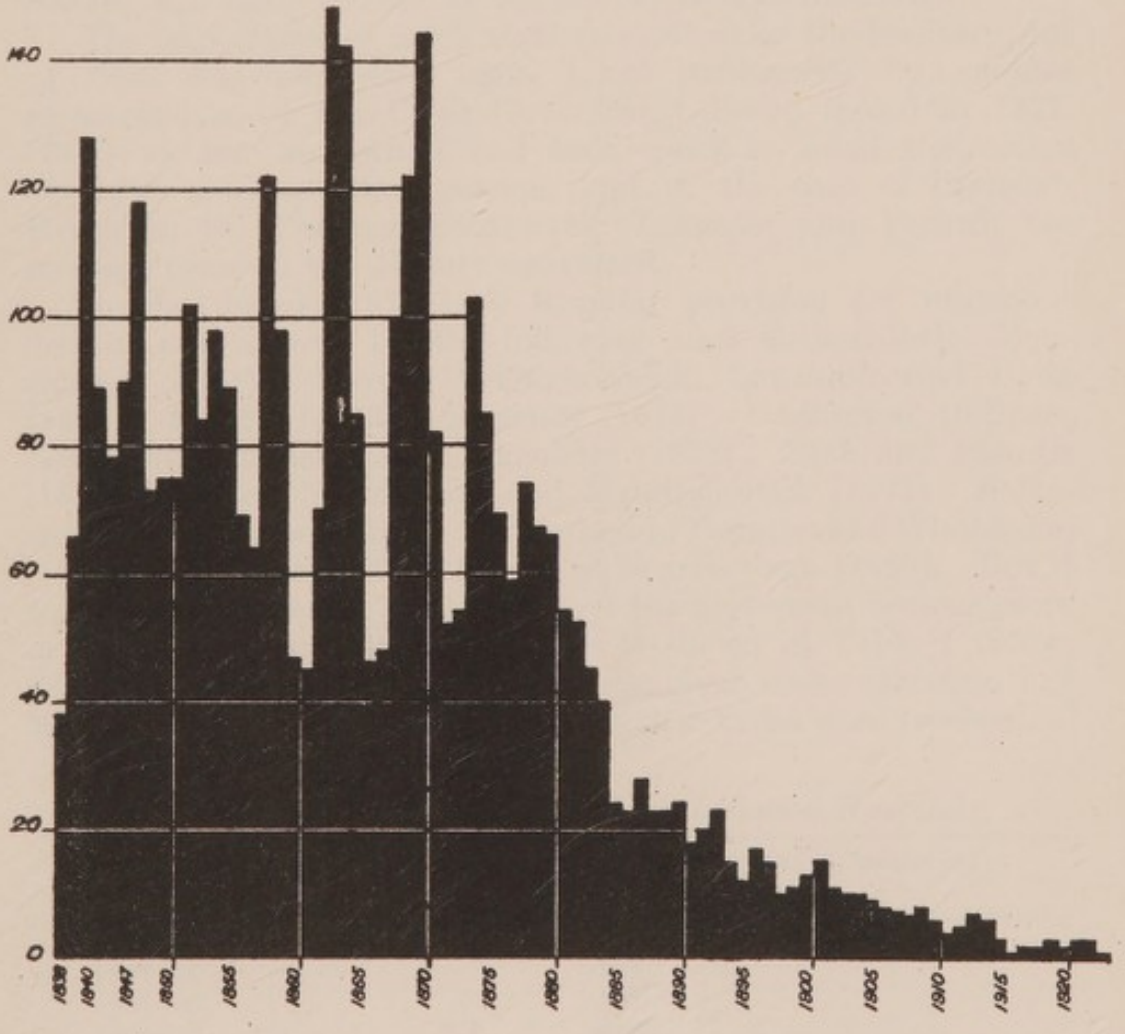
The enormous rates of mortality sixty years and more ago naturally caused considerable official and private anxiety. Ordinary folk do not pay much attention to figures, but such domestic tragedies as that of Dr. Tait (then Dean of Carlisle, later Archbishop of Canterbury), who lost five of his six children within a month through scarlet fever, were sufficiently frequent to convince the public that, in the words of Sir Thomas Watson, " sometimes the disorder defies all treatment and the deadliest forms of plague are not more fatal."

In the year 1863 an inquiry into the management of fever hospitals was conducted by Dr. Bristowe and Mr. Holmes (14). The old " pest houses " had been superseded in some places (about

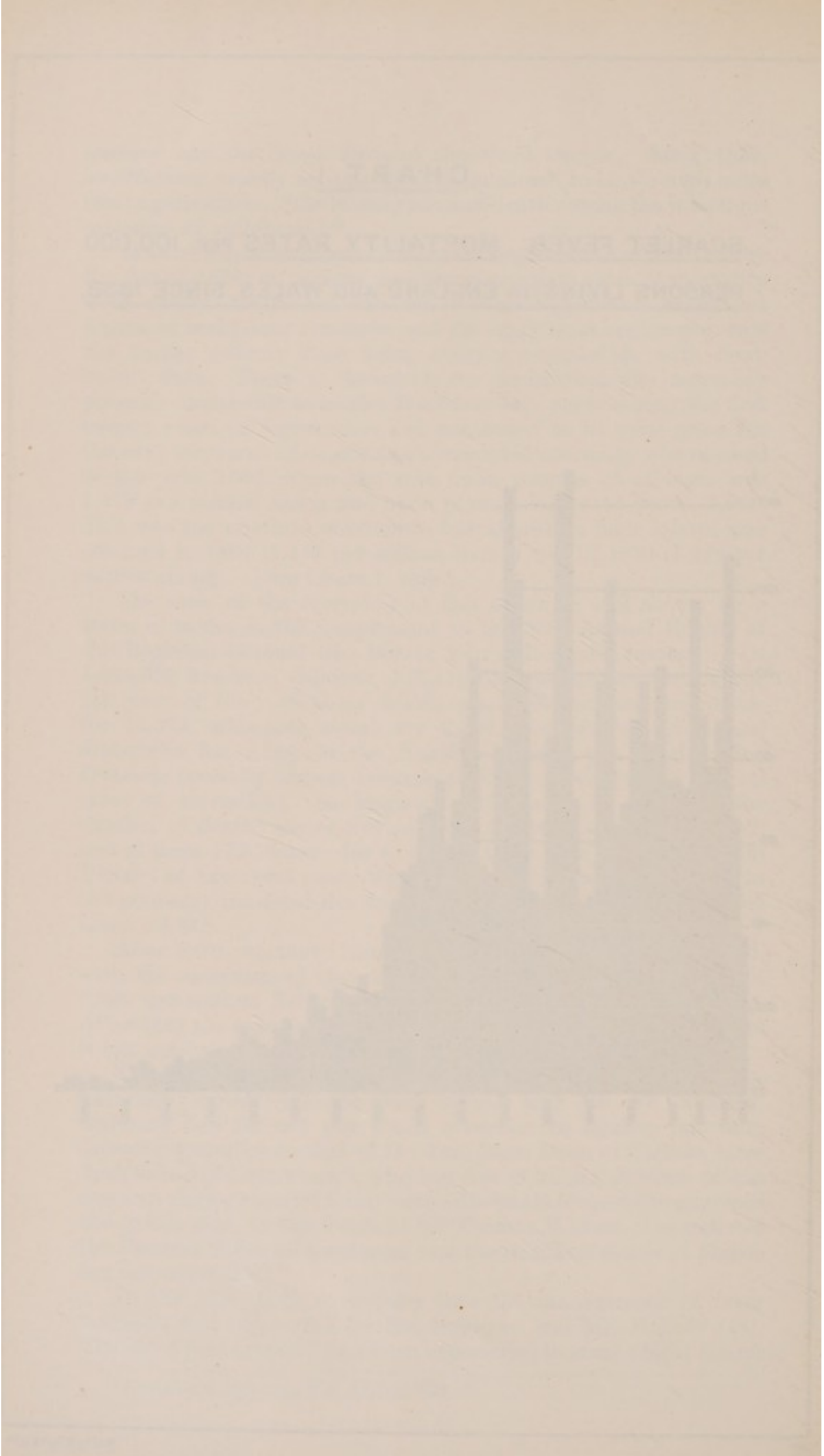
* Creighton, op. cit., Vol. II., p. 726.

CHART I.

SCARLET FEVER: MORTALITY RATES PER 100,000 PERSONS LIVING, IN ENGLAND AND WALES, SINCE 1838.



Malby & Sons Lith.



the year 1780) by more up-to-date hospitals for the treatment of infectious diseases; but as these proved insufficient, cases of infectious diseases, in 1840, were being distributed among general hospitals—with disastrous results. Then several steps in the right direction were taken when, in 1862, Dr. Murchison, at the London Fever Hospital, began to keep the various infectious diseases apart. Four years later the Sanitary Act of 1866 was passed, and conferred on Local Authorities powers for erecting and maintaining Infectious Diseases Hospitals.

In 1869 appeared the first official memorandum on scarlet fever which was issued by the Local Government Board, and entitled "Precautions to be taken against Scarlatina." (79a.) This memorandum of Sir John Simon was re-edited in 1876 by Dr. Seaton, and again in 1884 by the late Sir George Buchanan.

The importance of using their powers under the Sanitary Act of 1866 was impressed upon Local Authorities by another memorandum of the Local Government Board issued in 1871. (79b.) A few authorities had been quick to avail themselves of their newly-granted powers, and in the case of Carlisle*, Evesham, St. Pancras, Southwark, Leicester and Penrith the message came to the already converted.

In the decade 1871–1880 hospital provision for infectious disease was secured by the following local authorities†:—Manchester (1871); Dover, Wellingborough, Lowestoft and Ryde (1872); Halifax (1873); Coventry (1874); Darlington, Oldham, Lewes, Birmingham and Feckenham (1875); Bath and Ipswich (1876); Exeter, Warrington and Middlesbrough (1877); Folkestone and Blackpool (1878); Warrington, Taunton and Wimbledon (1879); Stockport, Kings Lynn and Scarborough (1880). But it was during the period 1881–1910 that the movement became more or less general and pronounced, as is shown in Table 1 below, which is compiled from the information given under Question 7 of Section A by those districts from which returns were received.

TABLE 1.

Showing progress made in providing Isolation Hospitals.

Decade.	No. of districts in which hospital isolation of scarlet fever was initiated.
1871–80	25
1881–90	101
1891–00	181
1901–10	216
1911–20	92
1921–24	26 (including 7 in Wales)

* A "House of Recovery" for fever patients existed in Collier Lane, Carlisle, as far back as 1820 and was maintained by public subscription. In 1832, when 440 cases of cholera occurred in Carlisle, this hospital had 177 beds. The coming of the first railway from the South in 1848 made it necessary to select another site at Crozier Lodge where, with various additions, the present hospital now stands and serves both the Borough and the Rural District of Carlisle.

† A return made in 1879 showed that 296 Local Authorities had by that time made some sort of provision in the matter of hospital isolation.

By 1880–81 it was considered opportune to review the situation, and in his classical report to the Local Government Board on " The Use and Influence of Hospitals for Infectious Disease " (123), Dr. (afterwards Sir Richard) Thorne Thorne showed the success that attended the removal of the first case of scarlet fever from a household containing other susceptible children. It was considered (at that time) that when the infected person had been promptly removed to hospital, and when his room had been immediately and carefully disinfected, no further cases occurred in the household and no quarantine was necessary for its members.

It was primarily in the public interest, therefore, that the hospital isolation of known cases of scarlet fever was first conceived and conducted. But it was becoming evident in some quarters, and particularly in the North, that the *known* cases of infectious disease did not represent the true extent of infection present at any given time, and that the publication of even these cases was often delayed and insufficient. It was felt that early removal of initial cases to hospital implied also early and complete information concerning such cases; so that, in certain towns, notification was introduced by virtue of Local Acts before general legislation took place.* Among such towns may be mentioned :—

1876	Huddersfield.
1878	Bolton, Burton-on-Trent, Jarrow, Leicester, Sutton.
1879	Blackburn, Blackpool, East Kerrier, Norwich, Penryn, Rotherham.
1880	Derby, Lancaster, Oldham, Preston, Stafford, Stanley, Warrington.
1881	Bradford, Barrow-in-Furness, Birkenhead.
1882	Accrington, Bury, Chadderton, Halifax, Macclesfield, Manchester, Newcastle-on-Tyne, Nottingham.
1883	Hartlepool, Portsmouth.
1884	Burnley, Croydon, Darlington.
1885	York.
1886	Ashton-under-Lyne, Penrith, Torquay.
1887	Chester, Darwen, Wakefield.
1888	Axbridge R., Bredbury, Kingston-on-Thames, Llanelly, Willesden.†

Then, in 1889, the first general Notification Act (adoptive) was passed and became widely adopted. Of the districts under review, for example, 212 give the year 1889, and 149 the year 1890, as the years in which notification of scarlet fever was initiated; but it was during the period 1889 to 1900, and after the (Compulsory) " Infectious Diseases Notification (Extension) Act " of 1899 was passed, that in 85 per cent. of the districts now under consideration notification became compulsory.

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* It may be mentioned that in April, 1882, the Local Government Board, by means of a circular letter, made enquiries concerning the working of these Local Acts on behalf of the Select Committee of the House of Commons on Police and Sanitary Regulations Bills.

† In Birkenhead, Blackburn and perhaps in one or two other places in this list scarlet fever does not at first appear to have been among the scheduled notifiable diseases.

In the meantime the mortality figures of scarlet fever had been steadily dropping throughout the country, in town and rural district alike. There was nothing to show at the time that the decline from the peak of 1874 (see Chart I.) was anything more than the usual periodic descent which would be followed in 5–7 years' time by another prominent peak. There was, indeed, a comparatively insignificant peak in 1878, but from that year onwards the mortality curve for scarlet fever has steadily declined, and fallen to such an extent that its present position on a chart that can comfortably comprise the earlier peaks is scarcely to be detected. At the same time, and possibly accounting for the reduced mortality, the fatality of the disease had also been diminishing in a most satisfactory manner, as can be seen from Table 2 below, where the statistics of the Metropolitan Asylums Board for the last 52 years are set out. It must, however, be remembered that the proportion of total cases treated in the Board's hospitals has increased, so that the fatality rates are not strictly comparable over the whole period covered by the statistics.

TABLE 2.

Average fatality-rates of Scarlet Fever cases treated in the hospitals of the Metropolitan Asylums Board during the period 1872 *to* 1924.

Quinquennial figures.

1872 to 1876	1877 to 1881	1882 to 1886	1887 to 1891	1892 to 1896	1897 to 1901	1902 to 1906	1907 to 1911	1912 to 1916
12·4	12·6	10·7	8·3	5·5	3·5	3·1	2·5	1·6

Yearly figures.

1917	1918	1919	1920	1921	1922	1923	1924
1·9	1·8	1·5	1·1	1·0	1·8	1·2	1·3

It seems clear that the decline in both mortality and fatality which began about 1875 preceded not only the compulsory institution of notification, but also the general provision of hospital facilities ; it is significant, however, that the year after which the general mortality from, and the personal prognosis of, scarlet fever began to improve, was also the year in which the great Public Health Act (1875) was passed, and which, among other things, was responsible for much-needed improvement in the housing conditions of the poor.

But while scarlet fever was beginning to lose its terrors, both for the general public and for the particular patient, other matters concerning control and treatment of the disease began to engage the attention of official bodies and clinicians. The disquieting occurrence of the Hendon outbreak in 1879 focussed considerable

attention for the next few years upon the dangerous possibilities of milk-borne epidemics. Arising out of these events a very considerable amount of work on the bacteriology of scarlet fever was carried out for the Local Government Board by Klein, while later M. H. Gordon also assisted the Board in a similar direction.

Next the unwelcome appearance of the "return case" prompted the Metropolitan Asylums Board in 1895 to make enquiries concerning the antecedents of these undesirables. This was followed in 1898–9 by an enquiry by Professor (now Sir William) Simpson (115), who, on behalf of the Metropolitan Asylums Board, sought the reasons for return cases of scarlet fever and diphtheria.* In 1901–2 Cameron (22a) made another enquiry, and submitted an exhaustive report to the Metropolitan Asylums Board in 1904. The return case, indeed, was seldom missing from the English literature of scarlet fever during the early years of the twentieth century. Among the contributions to the discussion of this time may be mentioned Killick Millard's (89a) contention that the aggregation of patients in hospital produced in them a "hospitalised" strain of virus and made the occurrence of return cases more frequent; the classical reports of F. M. Turner (127) and the researches of C. E. Matthews (84) and others, which led these observers to conclude that the infecting-rate among discharged patients decreased as the period of their detention in hospital was prolonged; the contrary finding of Franklin Parsons (98) that return cases are not prevented by long detention of convalescents in hospital; the closely reasoned treatise of Miles Arnold (1b), who emphasised the part played by home conditions; and the paper by Mervyn H. Gordon (47) in which he states that return cases in some instances are due to aerial convection. In 1904 the Society of Medical Officers of Health took the matter up and issued a questionnaire on the subject of return cases.†

But return cases were not the only subjects which, rightly or wrongly, attracted attention to the hospital isolation and treatment of scarlet fever. Despite the strong advocacy of Sir Arthur Newsholme (95) and others of isolation hospitals as a means of diminishing the spread of scarlet fever, it was thought by some authorities that, in this respect, isolation hospitals had not achieved all that was hoped of them and that they should rather be regarded as places where individual cases of scarlet fever

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* Among other conclusions it was found, or suggested, that 80 per cent. of "infective cases" suffered from mucous discharges, and that warm baths just before leaving hospital brought back a quiescent discharge; long detention in hospital does not reduce chance of return cases, but that local treatment of throat, etc., with transference to less infective wards is more likely to be efficacious for the purpose; personal clothing needed disinfection more than bedding and that return cases are not due to premature discharge from hospital.

† The Schedules of Inquiry were comprehensive and included questions relating to return cases both as regards hospital and home-treated patients. It appears that these schedules were intended for the use of medical officers interested in the subject, but that there was insufficient response to make possible any summary of experiences.

received the best possible care and treatment. It was, therefore, disconcerting when it was found that, by no means rarely, patients who were sent to hospital thereby acquired another infection such as that of diphtheria; while by some it was alleged that complications were rather prone to occur in the case of patients admitted to isolation hospitals. So, to prevent the risk of such "cross-infections" and complications, new methods of isolation were tried in various hospitals. As examples, may be quoted Caiger's experiment with cubicles at the South Western Fever Hospital in 1908 (21a); the "aseptic method" associated with Rundle and the Fazakerley Hospital, Liverpool (109), and practised at Plaistow and a few other places; the provision of small wards for segregating septic cases and the open air treatment so warmly advocated by Boobbyer at Nottingham (11).

By the beginning of the present century, however, there had accumulated a considerable body of opinion that isolation hospitals had not proved a very useful or economical part of the mechanism for the control of scarlet fever. Thus, at a meeting of the Metropolitan Asylums Board on December 7th, 1907, Dr. W. R. Smith moved:

> "That in view of the continued prevalence of scarlet fever, notwithstanding the extensive isolation accommodation which has been provided, the Local Government Board be asked to cause an inquiry to be instituted into the cause of this disease; and whether any, and if so what, further means can be adopted for its prevention."

On June 20th, 1910, Major W. A. Adam asked in the House of Commons for information concerning the use of infectious diseases hospitals and pressed the President of the Local Government Board to institute an inquiry. Such an inquiry was conducted by Dr. Franklin Parsons in 1910–11, and his report, which is a mine of reliable and interesting information, appeared as a supplement to the Medical Officers (Local Government Board) Annual Report for 1910–11 (98).

About 1909 Dr. Robert Milne (163), Medical Superintendent of Dr. Barnardo's Homes, began to practise and to preach the doctrine that the isolation of scarlet fever patients was unnecessary if from the earliest possible moment of his illness the patient's throat was thoroughly and repeatedly treated with carbolic lotion (1 in 10) and if his whole integument were anointed with eucalyptus oil. Great interest was shown in this novel method of treatment but, despite its continued use down to the present day by a few disciples of Dr. Milne, the method failed generally to yield any peculiar advantages in the hands of those who tried it; by not a few it was severely condemned by reason of its alleged ill-effects. Quite recently, however, and in order to avoid the increasing cost of hospital isolation, the Milne method, or some modification of it, has been re-tried in certain districts, notably in Tottenham, Southgate, Wealdstone and Isleworth.

In the autumn of 1921, and after seven years' comparative freedom, scarlet fever became severely epidemic, and in London the number of cases of scarlet fever and diphtheria combined was so great that even the hospitals of the Metropolitan Asylums Board were unable for a time to cope with the number of patients seeking admission.

> "Towards the end of October" (1921), states the report issued by the Infectious Hospitals Committee of the Metropolitan Asylums Board, "it was clear, in view of the unprecedented rate at which applications for admission were being received, that, when every bed at the Board's disposal was occupied, there would still be some cases outstanding. Accordingly after conference with representatives of the Ministry of Health and of the Metropolitan Medical Officers of Health, arrangements were made for all applications for the admission of cases of scarlet fever to be made in the first instance to the Medical Officer of Health, and for him to select the most necessitous cases and advise the Board thereon, preference in admitting cases to be given to the poorer and more crowded districts, especially to cases coming from homes where there was unemployment."

For the first time then, probably, Metropolitan Medical Officers of Health were constrained to *select* cases of scarlet fever for admission to the Board's fever hospitals, so great was the prevalence of the disease in London during 1921–2 ; the fatality at the height of the epidemic, however, was so low as 1·04 per cent.

In reviewing the report of the Metropolitan Asylums Board on these events the "British Medical Journal"* drew some general deductions, some of which may be quoted here as a conclusion to this section.

> "But problems of public health administration are not static, and it by no means follows that what is right in one phase of epidemic experience will be right in another. It may well be that the decline in severity of scarlet fever justified a radical reconsideration of the methods adopted for its control. The epidemiological features of the disease are now very different from what they were assumed to be when isolation during a prolonged period after attack came first to be regarded as the best and most certain safeguard against its spread. It is now a disease of low mortality and usually of slight severity with a comparatively high degree of infectiousness during the early days of attack, which rapidly subsides, though in exceptional cases it may be indefinitely prolonged. The measures devised for its control contemplated a disease of serious character, its infectiousness uniform during the period of a desquamation, but in the absence of complications ceasing definitely at the end of this period. The change of view which further knowledge has brought may well be ground for reviewing the whole practice with regard to the preventive measures adopted."

B. Origin, Scope and Methods of Present Enquiry.

A sufficient reason for the present enquiry may be found in Table 23, on page 431 of the Registrar General's "Statistical Review of England and Wales, 1923" ; portions of this table, with additions for subsequent years, are reproduced below.

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* March 25th, 1922, p. 496.

TABLE 3.

*Cases of Scarlet Fever notified per 1,000 population in the years 1911–1924.**

Year	England and Wales.	England.	Wales.	London.
1911	2·90	2·84	3·66	2·33
1912	2·98	2·95	3·35	2·51
1913	3·58	3·51	4·52	3·89
1914	4·47	4·38	5·40	5·54
1915	3·59	3·53	4·39	3·94
1916	2·19	2·14	2·89	2·07
1917	1·45	1·44	1·57	1·52
1918	1·44	1·44	1·44	1·72
1919	2·29	2·23	3·11	2·97
1920	3·19	3·10	4·35	5·01
1921	3·64	3·61	3·84	7·25
1922	2·85	2·85	2·75	3·80
1923	2·24	2·26	1·93	2·21
1924	2·16	2·18	1·83	2·51
1925	2·35	2·40	1·76	2·67

The figures in the table above show how uncontrollable scarlet fever has proved itself to be as regards its prevalence. There are periods such as that of 1915–1918, when the figures would seem to indicate a tendency for the disease to subside, but this period is quickly followed by another, 1919–1921, in which it becomes yearly more common, while the table as a whole shows no steady submission of the disease to all the forces employed against its spread. This state of things is all the more in need of investigation when it is remembered that in many large districts the proportion of susceptible children to the total population has diminished and that the figures of mortality, fatality and complications have all been steadily falling. Some further facts about the incidence of scarlet fever in England and Wales during recent years are shown pictorially in Chart 2 (p. 12).

The severe epidemic of scarlet fever in 1921, when the attack rate in London was 7·25 per 1,000, reinforced no doubt the growing conviction in many quarters that the time had fully arrived for overhauling the administrative machinery which had been built up for the control of scarlet fever. In this conviction the Ministry of Health shared. Thus in the Chief Medical Officer's Report for

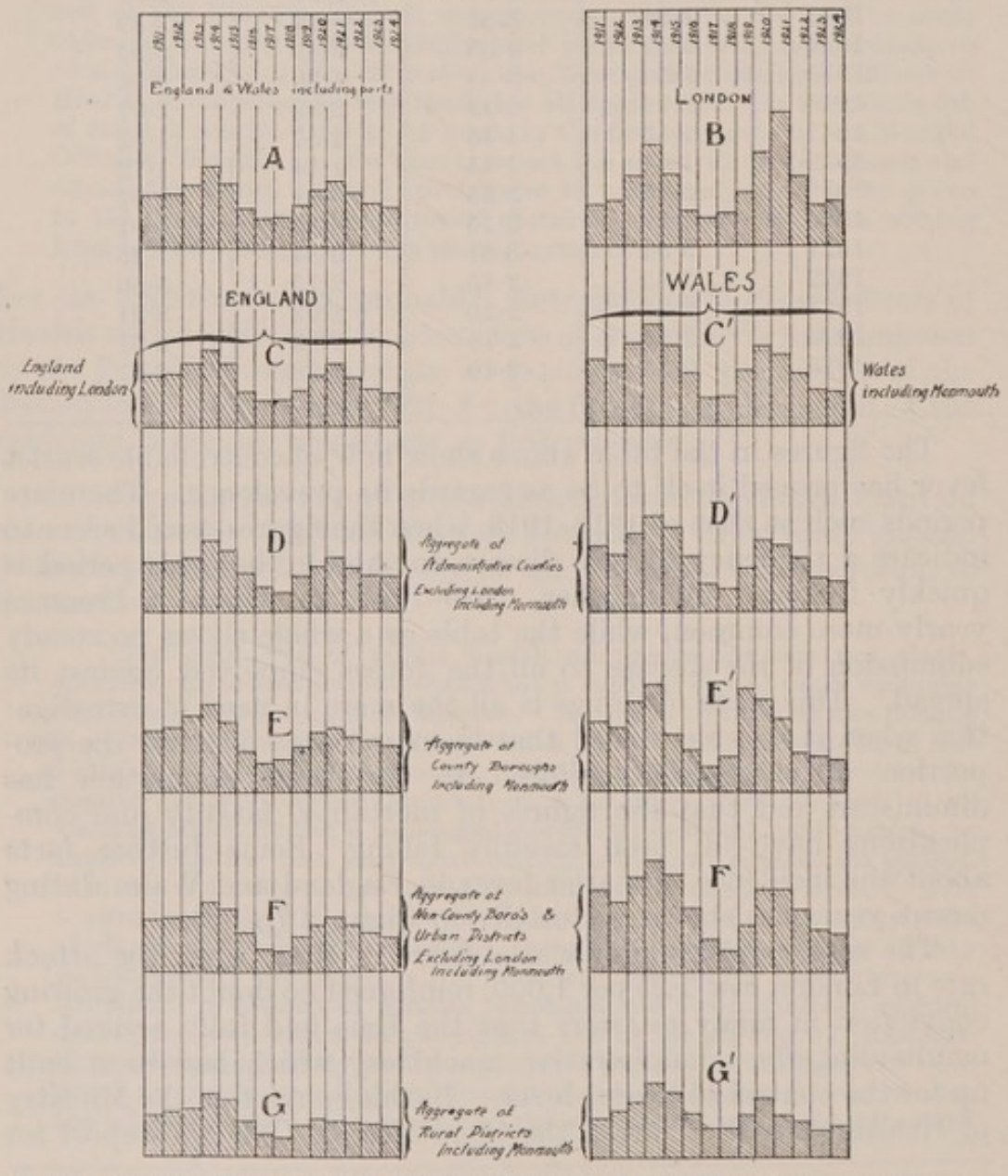
* The incidence rates in the administrative counties of England, for the years 1918 to 1924 inclusive, are shewn in Appendix G. It will be seen that during those years the average yearly attack-rate for England as a whole was surpassed on five occasions by Northumberland; on four by Durham and Middlesex; on three by Cheshire and Lancashire; on two by Oxfordshire, Warwickshire, Westmorland and Worcestershire; and on one occasion each by Berks, Essex, Gloucestershire, Isle of Ely, Northants, Norfolk, Somerset, Southants, Staffordshire, Surrey, Yorks N.R., Yorks W.R.

1921,* where a reference is made to the unusual epidemic of that year, it is stated :—

> "Epidemics of this nature impose a severe strain on the public health services and particularly on the institutional resources of the community, and the question arises whether the administrative methods of dealing with scarlet fever do not call for improvement."

CHART 2

Cases of Scarlet Fever notified per 1000 population 1911-1924



Again, in the Report for 1922† there is the following reference to the subject :—

> "For various reasons it is becoming of some importance to review the basis of ordinary administrative action taken in this country in regard to scarlet fever. Not the least of these reasons is the large direct and indirect expenditure which is incurred in the hospital isola-

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* "On the State of the Public Health, 1921," p. 50.
† *Ibid.*, 1922, p. 65.

tion of scarlet fever cases, disinfection of premises in which scarlet fever has occurred, and like measures."

Accordingly, an office conference was held on November 24th, 1922, to consider certain aspects of scarlet fever prevention, and particularly to map out a programme for investigations.* It was decided, in the first instance, to enquire mainly about (i) the customary length of detention of scarlet fever cases in hospital and the effect of longer or shorter retention of these cases on the occurrence of return cases and complications ; (ii) the experience of certain districts and institutions where methods of home-treatment have been, or are being, carried out ; and (iii) the general practice and opinions as regards terminal disinfection in the case of scarlet fever. To this end steps were taken early in 1923 to obtain the co-operation and advice of experienced medical officers of health and medical superintendents of hospitals in an investigation of the subject.

Questionnaire papers were designed to obtain information on the matters enumerated above and concerning certain other features of public health and hospital administration in relation to scarlet fever. A limited number of these questionnaires, appropriate to medical officers of health and hospital superintendents respectively, were sent out in July, 1923 ; some delay was inevitable at this holiday time of the year, but by October all the questionnaires had been returned. The results of this preliminary enquiry were encouraging and it was decided to extend the range of the enquiry. As regards hospitals, it was still thought advisable (in the extended investigation) to confine the enquiries to provincial hospitals, in order to break new ground, and to obtain collective information from the country at large which could be usefully studied alongside the accumulated wealth of information concerning London's fever hospitals which is so conveniently stored in the annual reports of the Metropolitan Asylums Board. At the same time it was realised that only from the larger provincial institutions was it possible to obtain data that would repay investigation, and so only 37 hospitals were added to the first list, making a total altogether of 62. The second issue of hospital questionnaires differed only slightly from the first, and their form is shown in Models A and B. (Med. 59 and 59A.) The distribution of the 59 hospitals from which information was received is shown on Map B (opp. p. 118), where the two chief clusters are seen to be situated in the London and Lancashire districts ; apart from this,

* The "conference" later became styled "Committee of Medical Officers on Scarlet Fever" and as such has continued to meet periodically during the enquiry. The following members of the Medical Staff have served on this committee under the chairmanship of Sir George Buchanan: Dr. H. A. Macewen, Dr. A. Arnold, Dr. T. Carnwath, Dr. A. Eastwood, Dr. M. Greenwood, Dr. J. R. Hutchinson, Col. S. P. James, Dr. W. A. Lethem, and Dr. A. C. Parsons (Secretary). In addition, the late Dr. R. J. Reece and the late Dr. F. W. Higgs were original members of the committee, and Dr. S. Monckton Copeman continued to serve on it after his retirement from the Ministry in March, 1925.

however, the hospitals are scattered over the country in a fairly representative way. The total number of beds (for all infectious diseases except smallpox) reported to be available in these selected hospitals is 8,134. The aggregate amount of accommodation in the extra-metropolitan fever hospitals of England and Wales is a variable quantity and it is almost impossible to ascertain accurately the total number of available beds at any given moment. It has been estimated, however, that in 1922 this number was, approximately, 30,000, so that on this basis the hospitals supplying information for this enquiry contain roughly 25 per cent. of the total number of beds in provincial fever hospitals.

In the larger hospitals the cases upon which information is based are mostly derived from the cities or towns in which these hospitals are placed ; but, as will be seen from the list in Appendix L, a considerable number of the hospitals also take in cases from adjoining areas, including rural districts.

MODEL A.

MINISTRY OF HEALTH. *Folio No. H/*

SCARLET FEVER INQUIRY.

SECTION A.—GENERAL INFORMATION.

1. Name of Fever Hospital.
2. Postal address.
3. Tel. No.
4. County.
5. No. of beds.
6. Districts served.
7. First opened for scarlet fever patients.
8. Average percentage of beds normally set aside for scarlet fever patients.

SECTION B.—SPECIAL INQUIRIES REGARDING HOSPITAL ADMINISTRATION.

1. In what type of conveyance are scarlet fever patients brought to hospital ?
2. Is a nurse in attendance with the conveyance ?
3. What system of isolation *is at present* adopted ? (Details of any special system such as the "bed," "barrier," "cubicle," "open air," etc., may be given under heading 11.)
4. Has any other method of treatment been *previously* tried and given up ? If so, what was the method and why was it discontinued ?
5. What standards, for scarlet fever patients, do you try to maintain as regards
   (*a*) Cubic space,
   (*b*) Floor space,
   (*c*) Wall space (*i.e.*, distance between contiguous beds) ?
6. Can you quote any evidence from your own practice showing that a relaxation of such standards has been followed by : (*a*) An increase in the number of complicated cases or of "cross-infections." (*b*) An increase in the number of "infecting cases" (*i.e.*, those producing "return cases") ?
7. Concerning the discharge from hospital of scarlet fever patients : what rules, if any, do you observe as regards the following ?
   (*a*) Minimum length of stay in hospital of uncomplicated cases.
   (*b*) Discharge from nose or ear ; condition of throat.

(*c*) Search for diphtheria bacilli. (If swabbing is practised, are the swabs taken from both nose and throat, and how often ?)

(*d*) Desquamation.

(*e*) Minimum length of stay in bed and transference from an acute to a convalescent ward, as regards uncomplicated cases.

(*f*) Final segregation in a discharge block.

(*g*) The last bath. (How long before discharge ; movements of patient between bath and discharge from hospital.)

h) Patient's clothes.

8. Are printed instructions concerning after-care sent with the patient on returning home ? Copies of such would be welcome.
9. Have any bacteriological investigations been made concerning the percentage of scarlet fever patients admitted to hospital with diphtheria bacilli in their throats or noses ? If so, with what results, and were any virulence tests carried out ?
10. Do you employ a specialist for the radical treatment of chronic morbid conditions of the nose, throat and ear ; if so, with what results ?
11. Further remarks, if any.

..... Date.....

Medical Superintendent.

(Med. 59.)

MODEL B.

Section C.—Scarlet Fever Statistics of the .....Hospital.

1. Year (Calendar).
2. Name of Medical Superintendent, year by year.
3. Total number of scarlet fever admissions.
4. Percentage of total admissions for all diseases.
5. Average day of disease on admission.
6. Average length of stay in hospital, in days.
7. Number of other patients who developed scarlet fever in hospital (cross-infections).
8. Number of scarlet fever patients who developed diphtheria in hospital (cross-infections).
9. Number of scarlet fever cases with severe complications. (See Note *a*.)
10. Percentage (of total admissions).
11. Number of deaths.
12. Percentage (case mortality).
13. Number of "infecting cases," *i.e.*, those responsible for "return cases." (See Note *b*.)
14. Percentage (infecting case rate).

Signature and date.....

Notes :

a. Such as nephritis, otitis, rheumatism, severe adenitis of neck glands, etc.

b. Please given the definition of a "return case" upon which you base the figures in columns 13 and 14.

As regards the other group of questionnaires, the Committee considered that the subject was one which intimately concerned every health officer; and, desiring to leave no source untouched from which the results of experience or the knowledge of fresh view-points could be obtained, the Committee decided to send out questionnaires to every medical officer of health who had not already been consulted. In fact, however, the second batch of forms were also sent to those officials who had received copies of the first issue in order to give them a chance of revision if they so desired. Many sent additional information in this way, and most of them were good enough to re-arrange their statistics on the new forms.

The first limited issue of questionnaires was accompanied by a request for constructive criticisms of the questionnaire papers themselves, and several useful suggestions were received and adopted. As a result, the final design of the questionnaires which were sent out in 1924 is that shewn in the following models —C (Med. 57), D (Med. 57A), and E (Med. 58A). The questionnaires sent to both medical superintendents of hospitals and to medical officers of health are arranged in three sections which deal respectively with (A) General information, (B) Information concerning the control and treatment of scarlet fever by the health officer or the medical superintendent as the case may be, and (C) Statistics. As regards the questionnaire sent to medical officers of health the same (buff) form was used for the answers to Sections A and B both in the case of single and combined districts.* Section C, dealing with statistics, was arranged differently, however, according to the nature of the district.

I. *Sanitary Districts.*

Nature of District.	England.	Wales.	England and Wales combined.
Administrative Counties (including Scilly Isles)	50	13	63
County Boroughs	78	4	82
Municipal Boroughs	224	29	253
Urban Districts	704	80	784
Rural Districts	574	73	647
Port Sanitary Districts	53	9	62
Totals	1,683	208	1,891

London = 29 Metropolitan Boroughs including the City of London.

* It may be noted that in this report "combined districts" mean not only those groups of districts which are officially styled "combined" or "united" districts, but also groups of two or more districts whch are under the care of a single whole-time medical officer of health but do not bear the official title.

II. *Health Officers.*

In charge of	England.	Wales.	England and Wales combined.
Administrative Counties	49	13	62
Combined Districts (officially designated as such, and others) ..	233	32	265
County Boroughs	78	4	82
Municipal Boroughs and Urban Districts	599	66	665
Rural Districts	270	38	308
Port Sanitary Districts	12	3	15
Metropolitan Boroughs	29		29
Totals	1,270	156	1,426

For single districts model D was designed and used for the purpose of obtaining yearly figures (notifications, admissions, deaths, etc.) over as long a period as possible. But in the case of combined districts (and especially for those made up of many component districts) it was thought more useful to obtain yearly average figures over a specified period of years (1912–1921) and for this purpose model E (a pink form) was used.

As a referendum of this extent and character is a comparatively rare event, the *number and varieties of sanitary districts* in England and Wales together with the *number of medical officers of health* (both whole-time and part-time officers) who hold appointments in these districts, is shown in the table above.

MODEL C.

MINISTRY OF HEALTH. *Folio No. D/*.....

SCARLET FEVER INQUIRY.

SECTION A.—GENERAL INFORMATION.

1. District..... County.....
2. Medical Officer of Health .....
   Address .....
3. Population of District, 1911..... 1921..... Acreage.....
4. General character of district (residential, industrial, mining, etc.).
5. Has there been any change in the age distribution of the population during recent years ? If so, in what direction.
6. Name of hospital or hospitals to which cases of scarlet fever may be sent.
7. When were such hospitals first used for the isolation of scarlet fever cases ?
8. When was the notification of scarlet fever made compulsory in the district ?

SECTION B.—SPECIAL INQUIRIES REGARDING ADMINISTRATION IN RELATION TO SCARLET FEVER.

1. Under what circumstances do you consider removal of scarlet fever patients to hospital (*a*) advisable, or (*b*) imperative in your district ?

2. With regard to removal of scarlet fever patients to hospital—
   (*a*) How is admission to hospital usually arranged ?
   (*b*) Does the Medical Officer of Health satisfy himself in each instance that the case is one where isolation and treatment in hospital are essential ?
   (*c*) Can admission be otherwise arranged, as by direct reference to the Sanitary Inspector or to the hospital authorities ?
   (*d*) Do the same arrangements hold good both in epidemic and in inter-epidemic times ?

3. To what extent, in your opinion, has hospital isolation affected locally—
   (*a*) The prevalence of scarlet fever.
   (*b*) Scarlet fever mortality in its relation to the general mortality.
   (*c*) The fatality (case mortality).
   (*d*) The occurrence of case complications (such as otitis, rheumatism, nephritis, etc.) ?

4. Is it your practice to " follow up " scarlet fever convalescents in houses where susceptible children are living ?

5. Have you any data establishing a possible connection between the occurrence of " return cases " and overcrowding in the houses concerned ?

6. What methods do you employ to secure the best possible isolation for home-treated patients ?

7. Has any special form of home-treatment been tried, either as a deliberate policy through lack of hospital accommodation, or for other reasons ? If so with what results ?

8. If any system of home supervision and treatment has been practised what actual staff was found necessary ?

9. Can you give any figures of the comparative cost to the Council of scarlet fever patients sent to hospital and those treated at home ?

10. What rules of procedure have you personally found satisfactory regarding the continuance at, or return to, school, business, etc., of contacts and convalescents respectively ?

11. What methods of disinfection (if any) are carried out by your Council after removal of scarlet fever patients to hospital, or—in the case of home-treated patients—after release from isolation ? Information is required with reference to—
   (*a*) The mattress, palliasses, bolsters, etc.
   (*b*) The bedclothes and personal garments of patient.
   (*c*) The furniture of the room.
   (*d*) Toys, books, etc., used by patient.
   (*e*) Food and drink utensils used by patient.
   (*f*) The sick room itself.
   (*g*) Other parts of the house (hall, bathroom, W.C., etc.).

12. How far do you consider any or all of these expedients helpful in preventing the spread of infection ?

13. What is the average cost per case to the Council for disinfection, excluding wages of staff employed ?

14. Have you any records of infection through fomites ? If so, give particulars.

15. Have you any evidence pointing to fleas or other insects having acted as carriers of scarlet fever infection ?

16. Additional observations, if any. (An expression of opinion, *based on your own experience*, is desired concerning these two matters : (*a*) The main factors in the spread of scarlet fever infection ; (*b*) Any tendency, or not, for scarlet fever to re-assume a severe form in your present district.)

..... *Date*.....

Medical Officer of Health.

(Med. 57.)

MODEL D.

SECTION C.—SCARLET FEVER STATISTICS OF THE

.....DISTRICT.

1. Year (Calendar).
2. Population at decennial periods (*a*).
3. Total no. of Scarlet Fever cases notified.
4. Attack rate per 1,000.

Cases sent to Hospital—

5. No. of cases admitted.
6. Percentage of total notifications.
7. No. of deaths.
8. Percentage (case mortality).
9. No. of "Return cases" (*b*).
10. Percentage ("Return case rate").

Cases treated at Home—

11. No. of cases treated at home.
12. Percentage of total notifications.
13. No. of deaths.
14. Percentage (case mortality).
15. No. of "Return cases" (*c*).
16. Percentage ("Return case rate").

Signature and date.....

Notes :

a. To express the population for each inter-census year: one-tenth (1/10) of the difference between the census figures of the two decennia in question may be added to, or subtracted from, the figures of each preceding year.

EXAMPLE: year 1901—population @ 17,000
„ 1911 „ @ 19,000

To 17,000, add one-tenth of the difference (*i.e.*, 200) and the population for 1902 is 17,200, for 1903 it is 17,400, and so on. If the figures for 1901 and 1911 were reversed, the figures for 1902 would be 18,800, for 1903, 18,600, and so on.

b and *c*. The usual period allowed when speaking of a "return case" is 28 days after the return home of the scarlet fever case from hospital, or 28 days after the release of the scarlet fever case from isolation at home. If you use "return case" in any other significance please state here.

(Med. 57A.)

MODEL E.

SECTION C.—SCARLET FEVER STATISTICS OF THE

.....COMBINED DISTRICT.

YEARLY AVERAGES *for period January* 1*st*, 1912, *to December* 31*st*, 1921.

1. Component districts.
2. Mean population (*i.e.*, the sum of census figures for 1911 and 1921 divided by 2).
3. TOTAL number of notifications for period 1912–1921, inclusive.
4. Average yearly number of notifications.
5. Average yearly attack rate (M.).

Scarlet Fever cases sent to Hospital—

6. TOTAL number of cases admitted.
7. Average yearly number.
8. Average percentage of yearly notifications (M.).
9. TOTAL number of deaths.
10. Average yearly case mortality (M).
11. TOTAL number of "return cases" (*a*).
12. Average yearly "return case" rate (M).

Scarlet Fever cases treated at Home—

13. TOTAL number of cases treated at home.
14. Average yearly number.
15. Average percentage of yearly notifications (M).
16. TOTAL number of deaths.
17. Average yearly case mortality (M).
18. TOTAL number of "return cases" (*b*).
19. Average yearly "return case" rate (M).

Signature and date.....

Notes:

M. This will be filled in at the Ministry.

a and *b*. The usual period allowed when speaking of a "return case" is 28 days after the return home of the scarlet fever case from hospital, or 28 days after release of the scarlet fever case from isolation at home. If you use "return case" in any other significance please state here.

(Med. 58A.)

During the examination of these returned questionnaires several matters were discovered upon which more information was desirable, and this information was obtained by several subsidiary investigations—involving visits to certain towns, the issue of supplementary questionnaires and considerable personal correspondence.

Moreover, it was found inevitable as the enquiry proceeded that the Committee should take cognisance of the new work that was being done on the bacteriology of scarlet fever, particularly in America and Italy. At the end of 1924, therefore, the scope of the enquiry was enlarged to include experimental investigations into the following matters: (*a*) the practical utility of the Dick test and Schultz-Charlton reaction, (*b*) a systematic study of the streptococci associated with scarlet fever and their serological reactions, and (*c*) the comparative results of Schick-testing a consecutive series of scarlet fever cases and suitable aggregations of normal persons, or of persons suffering from other infectious diseases. For the purpose of these investigations the Ministry's Bacteriological Department were associated with Professor Beattie and his assistants at Liverpool; with Professor Topley, and assistants at Manchester; and with Drs. O'Brien and Okell of the Wellcome Physiological Research Laboratories. Clinical facilities were provided by the Monsall Hospital, Manchester, and by the Fazakerley Hospital, Liverpool, while Dr. Forbes, of Brighton, also co-operated in the Dick test investigations.

C. The Material Analysed.

(1) *Hospitals.*—Returns were received from 59 out of the 62 provincial hospitals in England and Wales to which questionnaires were sent. These returns, as explained before, were made on two slightly different issues of questionnaires; the differences exist chiefly in the statistical section, while the questions asked in Sections A and B remain practically the same in the two issues, which have, therefore, been considered together in the analysis.

The general information asked for under Section A will be found tabulated in Appendix L, which gives the complete list of those fever hospitals which have helped in the enquiry.*

Information on each of the specific questions in Section B of the questionnaires was supplied by all the reporters and will be found analysed, for the most part, in Section II D of this report under the heading "Hospital Administration." Additional "remarks" were made by several reporters; by others notes, memoranda, or reprints were attached to the questionnaires—notably in the cases of Bristol, Birmingham, Bury, Darlington, Fazakerley, Hornsey, Manchester, Newcastle, Plaistow and Swindon.

As regards the statistical Section C, there was not the same degree of completeness in this as in the other sections, but rather more than half of the reporters were able to provide statistics going back through a period of 10 years or over; Dr. S. G. Mostyn (Darlington) delved deepest and was able to trace certain records back to 1875. In about one-third of the returns the statistics were very nearly complete as regards all the columns and the statistics from Leeds, Middlesbrough (7 years), Norwich, Nottingham, Plymouth and Willesden are marked by the fewest number of gaps. Fifty per cent. of the reporters were unable to supply any useful series of records concerning the average day of the disease on which scarlet fever patients were received into hospital; in a third of the returns the information concerning cross-infections was obscure, while in an equal proportion of returns figures for the infective case-rate were lacking.

(2) *Sanitary Districts.*—Altogether, questionnaire papers relating to 1,164 sanitary districts and representing the reports and opinions of 886 health officers have provided most of the material for analysis in the present enquiry; further details are shown in the following table.

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* In this list the hospitals in question are fully designated according to the answers given under questions 1 and 2 of Section A; whenever mentioned in the text of the report, however, the various fever hospitals are briefly indicated by the name of the town near which they are situated or with which they are chiefly concerned: thus "Little Bromwich Fever Hospital, Yardley Road, Small Heath, Birmingham" is called in the text the Birmingham Hospital.

TABLE 4.

Measure of RESPONSE TO THE QUESTIONNAIRES *sent out to Medical Officers of Health.*

—		Medical Officers of Health.	Districts.		
			County Boroughs.	Municipal Boroughs and Urban Districts.	Rural Districts.
England.	Number from whom, or which, returns were received.	805 (including London)	73	606	388
	Percentage of those consulted.	62·6	93·6	65·3	68·6
Wales.	Number from whom, or which, returns were received.	81	3	53	41
	Percentage of those consulted.	51·9	75·0	48·6	50·0

Forms were also received from 6 County Medical Officers of Health (4 in England, 2 in Wales), and from 2 Port Sanitary Districts.

Information under Section A was completely given in virtually all the papers returned and it has been summarised in Appendices J and K. These appendices may be regarded also as an index both to the districts from which the questionnaires were returned and to the medical officers of health who returned them.

In Section B a large mass of information regarding administrative practice has been collected. The requests for individual opinions on the occasions for, and results of, hospital treatment; on the methods of spread and on the present nature of the disease, also met with a wide response. Questions 4, 5 and 8, on the whole, did not yield much positive information but, in this instance, this fact in itself is not without a certain amount of significance.

There is hardly a report which does not include a certain number of statistics under Section C of the questionnaire. The number and completeness of these statistics vary in different districts and according to local circumstances. The fullest and most extensive statistical reviews are provided, naturally, by the county boroughs and larger towns with long-established and well-organised office organisations. The differentiation of notified cases into those treated in hospital and those treated at home was made in all the returns and this has proved of the greatest service

during the analysis. In Appendix H will be found a table which shows the comparative extent to which these two methods of treatment are carried out in the country.

As regards particular questions in the statistical sheets it may be said that the best response is in the case of those relating to the incidence or prevalence of scarlet fever, and for some districts the notification figures extend back for a considerable number of years. Many of the more valuable returns in this respect have been specially utilised by Dr. Greenwood in his statistical studies. (See Appendix A, p. 226.)

There are, too, many data concerning local case mortality, but as regards return-case figures the yield, generally speaking, is a poor one. It may be mentioned, however, that it was often difficult to interpret with confidence the symbols, or absence of symbols, in Columns 9, 10, 15 and 16: a "—," for instance, might mean a "clean bill" as regards return cases or an absence of all records in the matter. Throughout the analysis of Sections A and B the statistics in Section C have been used to check, corroborate, or illustrate the results obtained, and especially is this so in Section G of the present report, where Hospital and Home Methods are considered together.

(3) *General.*—As stated previously, the specific answers to the questionnaires have formed most of the material for the following analysis or digest; but in not a few instances some additional information has been provided in the shape of supplementary reports, explanatory notes, printed regulations, etc. Such contributions, for example, from Birmingham, Brighton, Bristol, Bury, Darlington, Devizes, Hornsey, Linton, Liverpool, Loughton, Manchester, Newcastle-on-Tyne, Newport (Mon.), Northampton, Redditch, Salford, Swindon, Willesden and S.W. Gloucestershire, Leicestershire and South Oxfordshire Combined Districts, have been welcome and useful aids in the analysis. From other districts and hospitals also the Committee has asked for, and received, additional information of value.

Thus, further investigations have been made and reports received concerning such matters as the following:—

(a) *Open-air treatment.* (Bristol, Newcastle-on-Tyne, Nottingham, Swindon.)
(b) *Employment of otologists on the staff of Fever Hospitals.* (Edinburgh, London, Newcastle-on-Tyne.)
(c) *Length of stay in hospital of uncomplicated cases.* (Birkenhead, Bristol, Newcastle-on-Tyne, St. Helens, Wallasey.)
(d) *The occurrence of complications.* (Birkenhead, Bristol, Cardiff, Hornsey, Liverpool, Manchester, Newcastle-on-Tyne, St. Helens, Swindon, Wallasey, West Ham.)
(e) *The Milne treatment.* (Heston and Isleworth, Tottenham, Wealdstone and other places.)
(f) *Home treatment.* (Bristol, Tottenham, Walsall and other places.)

(g) *Terminal disinfection.* (Bournemouth, Brighton, Greenwich, Hove, Islington, Stepney, Wallasey, and many other places.)

(h) *Prolonged infectivity of Carriers.* (Shrewsbury, Swindon, Winchester.)

(*i*) *Cost of scarlet fever patients in Infectious Diseases Hospitals.* (Fylde J.H. Committee; Staines J.H. Committee; Guildford J.H. Board; Rochester and Chatham J.H. Board and Wandle Valley J.H. Board.)

(4) *Experience in other Countries.*—Although the present volume relates almost exclusively to English material obtained in the ways above indicated, and its conclusions relate to English practice, it must not be inferred that foreign experience has been left out of account in the conduct of the inquiry. In 1924, in order to strengthen the investigation from this aspect, Sir George Buchanan, as British delegate, invited the representatives of the many countries represented at the International Health Office in Paris to contribute information regarding the epidemiology of scarlet fever, and the measures taken to deal with its prevalence by the several administrations with which they were concerned. This request met with a ready response, and an epitome of the whole enquiry made by the International Health Office into the comparative prevalence of scarlet fever, its characteristics, and the means adopted to prevent its extension in different parts of the world, has recently been published in the Bulletin of the Office.* As, moreover, the British delegate undertook the duties of reporter on the subject to the International Health Office, he has been able to direct the attention of Dr. Parsons and the Committee of Medical Officers to numerous points of foreign experience of which it seemed desirable to take account n our own investigations and conclusions.

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* Monthly Bulletin of the Office International d'Hygiène publique, Vol. XVIII., 1926, Nos. 6 and 7.

See also the Procès-Verbaux of the Sessions of the Office International d'Hygiène Publique, May-June, 1926, pp. 9–11 and pp. 50–59.

PART II. ANALYSIS OF INFORMATION RECEIVED.

A. Opinions expressed in the Reports on Certain Matters connected with the Natural History and Control of Scarlet Fever.

The main object of the inquiry was to collect facts and figures concerning certain of the administrative methods employed by various local health authorities in the control of scarlet fever, and the results that have been produced by such methods. At the same time it was realised that the inquiry provided an excellent opportunity for obtaining from health officers their personal opinion regarding some important matters in the natural history and control of scarlet fever. An expression of opinion, based where possible on the personal experience of medical officers of health, was invited, therefore, on the following matters: (*a*) the circumstances under which scarlet fever patients should be removed to hospital (Question 1); (*b*) the effect of hospital treatment on the natural history of the disease (Question 3); (*c*) the value of terminal disinfection (Question 12); (*d*) the methods by which scarlet fever is spread (Question 16*a*), and (*e*) the possible re-appearance of a severe type of the disease in this country (Question 16*b*). The first and third of these subjects are dealt with more appropriately in other parts of the report but (*b*), (*d*) and (*e*) will be considered here, together with the subject of return cases.

(1) Methods of Spread of Scarlet Fever.

Below is set out an analysis of the various answers in which reporters recorded their opinions concerning the ways in which scarlet fever is spread.

It would not, however, be just to the recorders to argue that the insertion of one possible factor in the schedule of enquiry and the omission of some other means that the recorder attaches no importance to the latter.

(i) *Nature of the disease.*

The present mild type	111

(ii) *Personal susceptibility.*

Accumulation of susceptibles	2
Familial idiosyncrasy	1
Children with enlarged tonsils	7
,, ,, sores or wounds	7

(iii)	*Personal contagion*		245
	With patients ("case-to-case" infection) in the early and brief period of infectiousness		69
	With patients suffering from nasal discharges ..		32
	With patients, through the breath		12
	,, ,, ,, ,, skin		10
	,, ,, ,, discharges		9
	,, convalescents, generally		9
	,, ,, with discharges		54
	,, ,, who remain infectious for an unusual time		21
	,, ,, emanating from towns ..		29
	,, ,, in process of peeling		6
	,, ,, with "colds"		5
	,, carriers, generally		50
	,, ,, with enlarged tonsils		23
	,, ,, ,, nasal discharges		5
	,, ,, ,, ear discharges		4
	,, ,, ,, carious teeth		1
	,, healthy intermediaries		1
(iv)	*Aerial infection*		2
(v)	*Fomites.*		
	Milk		26
	Other fomites		58
(vi)	*Social circumstances.*		
	Aggregation in schools	168	
	,, ,, cinemas	33	233
	,, ,, schools and cinemas and other public places	32	
	Overcrowding in homes		43
	Lack of ventilation in homes		14
	Parents' carelessness	32	
	,, ignorance	19	60
	,, wilfulness	9	
	Increased facilities for transport		22
	Visits from neighbours		11
(vii)	*Administrative causes.*		
	Diagnosis missed		320
	,, delayed		14
	Notification defects		12
	Isolation delayed		22
	,, imperfect		40
	Disinfection inefficient		1
	School closure		3
	Overlapping of functions of M.O.H. and S.M.O.		1
	Premature return to school		5
	Home isolation		6
	Hospital isolation		2

(viii) *Miscellaneous factors, infrequently mentioned.*

Drains	3
Weather	2
Soil	1

Accepting the general opinion that most cases of scarlet fever are contracted directly from another human source, and that the infecting person may be quite unrecognisable either as a mild case or as a clinically healthy carrier, it is easy to see how the conditions of to-day favour the spread of scarlet fever and make its control a very difficult matter. The aggregation of people in towns and cities, the enormous increase of transport facilities and the growing inclination to be carried in vehicles rather than to walk, the social recreations such as dancing and cinema entertainments, all these facts of modern life have multiplied the opportunities for susceptibles coming into contact with infectives; they have also made it almost impossible in thickly-populated districts to trace any case to its origin. Schools, however, while providing undoubted opportunities for dissemination and despite the actual responsibilities laid at their doors by some reporters, do not probably at the present day play such a large part in the spread of scarlet fever as is often supposed. Rather, it may be believed that, since the introduction of the School Medical Service, they often act as observation posts where children indisposed from any cause are soon detected and where suspected cases of infectious disease are at once reported as would not always be the case at home. It is an undoubted fact also that in schools, as elsewhere, infection does not always spread when opportunities for its doing so seem most favourable; it is an uncommon experience, for example, to find that a case occurring in any particular class gives rise to many, if any, other cases. Possibly, as the late Dr. R. J. Ewart deduced, "susceptibility is a much greater factor in reaction to the presence of the virus of scarlet fever than chance of infection."

From enquiries made elsewhere we are inclined to agree with the reporter who thinks that the special dangers of the puerperal period as regards scarlet fever infection of the lying-in woman has been exaggerated in the past.

Only one reporter* referred to the special susceptibility to

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* Dr. Hill (S. Oxford C.D.) quotes the following examples:—

No. 1.—Female aet. 42. Admitted to cottage hospital for minor gynæcological operation. Within a week developed headache, sore throat and typical rash. Removed to Isolation Hospital. No known cases of scarlet fever in the district at the time. (Bicester U.D., 23.2.1.).

No. 2.—Female aet. 22.—Admitted to hospital with typical moderately severe attack of scarlet fever developing after removal of ingrowing toe-nail. The only case in the district at the time. (Bicester R.D. Ref. No. 24.1.1.)

No. 3.—Female aet. 22.—Developed attack of scarlet fever while suffering from abrasion of skin on side of face. This case of scarlet fever was of a severe type. (Culham R.D. Ref. No. 23.30.20).

scarlet fever infection which is sometimes found in the case of persons with surgical wounds or other injuries of the skin.

As regards methods of spread other than by direct contact, it is clear that nothing scientifically definite can be said on this point until it is decided whether or not the virus of scarlet fever can, and does in fact, remain outside the body for an appreciable length of time in a living and active state.

(2) The present type of Scarlet Fever.

Among the additional observations invited from medical officers of health was a specific request for the personal opinion of each reporter concerning "any tendency, or not, for scarlet fever to re-assume a severe form."

Opinions were given by all the reporters, with very few exceptions, and an overwhelming majority stated that they had observed no such tendency towards a severe type; most of these reporters, indeed, took the opportunity of saying that the tendency was altogether the other way and that the characteristic of the disease as they had observed it of recent years was its mildness.

On the other hand, there were some 60 reporters whose replies differed in varying degree from the general verdict.† Some of these, while seeing no tendency for scarlet fever generally to re-appear in a severe form, report in the sense of the following answer: "During the last year several cases were of a more virulent nature than in previous years, but on the whole scarlet fever is still of a mild character in this district." Family disposition as a cause of sporadic severity is mentioned by several contributors. In the two following, somewhat complementary,

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No. 4.—Male aet. 39.—Received severe scalp wound by fall from bicycle. Confined to bed. Three days after developed typical attack of scarlet fever of moderate severity. (Headington R.D. Ref. No. 23.108.93.)

No. 5.—Female aet. 59.—Had nasal polypus removed. Three days after developed attack of scarlet fever. Severe rash, typical tongue, throat only moderately affected. (Headington R.D. Ref. No. 24.64.50).

No. 6.—Male aet. 8.—Within a week of receiving crush to finger (superficial whitlow) developed typical attack of scarlet fever. This patient had a very severe attack, throat severely affected. Subsequent nephritis. (Thame R.D. Ref. No. 24.3.1.)

† In reply to another question, Dr. Edwards (Bournemouth) states that he has lately been recognising two types of scarlet fever: "(*a*) the big class of cases including the few septic and very few toxic cases that now occur and the general run of cases with a well-marked rash, a red soft palate, tonsilitis and a tongue that peels. (*b*) A type differing from (*a*) by its mildness and also by the fact that the tongue, although more or less suggestive of the characteristic "strawberry tongue," is yet not very different from the red tongue that one sees in a child on the second or third day of the furred tongue after gastric disturbance." This second class of case Dr. Edwards is inclined to leave at home but he adds (writing on 29.5.25) "that the last 10 months have given us more sepsis and septic complications, such as otorrhœa, sore noses, etc., in scarlet fever and diphtheria than I have ever seen before."

replies a local strain of the disease is thought to account for the occasional occurrence of severe or toxic cases :—

> " I have noticed before that cases which are infected from a foreign source are generally more severe than those infected from a local source even though the infection had come from where a mild type of the disease was prevalent, rather suggesting that a new type or strain may receive enhanced virulence by a fresh soil." (Dr. D. Brewer, Swindon).
>
> " No sign of any general increase of severity in local type of scarlet fever during recent years, but people who belong to races or families who have not suffered from scarlet fever and who may become infected by our local strain are liable to develop symptoms of alarming severity. I saw two examples of this in 1913 when two sisters from South Ireland, belonging to such a family, came as probationers from their country home in County Wicklow to our isolation hospital. They both had scarlet fever of old-fashioned severity and one developed secondary scarlet fever nephritis which did not clear up." (Dr. P. Boobbyer, Nottingham).

Dr. (now Sir) John Robertson (Birmingham) writes : " There is no evidence that scarlet fever intends to re-assume a severe form. While this is the case it is a fact that whenever scarlet fever begins to assume an increased prevalence the type of case is much more severe, and after this period of severe attacks has passed the type of case comes back to a more or less mild condition." Correlation between case severity and epidemicity is also noticed in the following replies, among others :—

> " Generally speaking there is no increase of severity, but about the middle period of an epidemic isolated cases of a more severe type are found particularly when there have been several years of comparative freedom from the disease." (Dr. J. B. Ferguson, Smethwick).
>
> " I have noticed in some epidemics that the *later* cases assume a malignant type." (Dr. J. Steel, Kidsgrove U.D.).
>
> " During the early part of the recent (1922) epidemic the cases were extremely mild. Later the cases, though less in number, became more severe and quite a number of very bad cases occurred." (Dr. H. E. Collier, Redditch).
>
> " In 1922 and 1923 when the disease was epidemic a severe form was re-assumed." (Dr. Sisam, Abingdon U. and R.D.).
>
> " Yes. The epidemic in 1923 at first was of a very mild character ; some of the later cases were extremely toxic." (Dr. W. T. Hessel, Pontefract).

On the other hand, Dr. T. P. Cole, Bognor, writes : " Scarlet fever, though slight in incidence during the years 1922–3–4, has certainly been severe in form. The initial fever has been higher and longer in duration and the occurrence of complications has been much more frequent ; suppurating glands have occurred frequently and transient nephritis also." Compare also the experience of Dr. W. Johnstone, Peterborough :—

> " Periodically severe cases crop up from time to time even in the midst of a generally mild strain and in times of low incidence."

Then a periodic return to a severe type is noticed by three reporters as follows :—

> " General periodic tendency to re-assume a severe form every seven, or multiples of seven years." (Dr. A. K. Towers, Jarrow).
>
> " In this district our experience has been that we have a four

years' cycle of scarlet fever and during that cyclic epidemic we often get a number of severe cases." (Dr. J. Robertson, Darwen.)

"I have noticed no tendency yet for scarlet fever to re-assume a severe form in this district, but a chart showing the annual number of deaths suggests to me that the severity of the disease is about to increase slowly. It suggests the possibility that, in addition to the 4 years' epidemic waves and the larger 15–20 yearly waves, there is a still greater wave covering a number of these second waves and that the severity of the disease, as shown by the deaths, follows this wave rather than the shorter period waves." (Dr. J. D. Ingram, Crewe).

Dr. R. de V. King's specific example of scarlet fever severity in recent years refers to a milk-borne epidemic in the Ilkeston district of Derbyshire. He writes :—

"In 1922, out of 53 patients, there were 27 cases of a toxic variety, due to milk-borne scarlet fever, isolated at Basford Isolation Hospital. During the latter end of 1923 (October to December) eight patients were admitted to the hospital and two of these were very toxic; one of them died with generalised arthritis, albuminuria and purpura hæmorrhagica; the other developed septic pneumonia and empyema but recovered after operation. These patients and a few others commenced their illness with severe diarrhœa. In 1924 the cases were still of an acute type during January and February, but since then have been of a milder variety."

In the majority of replies under discussion it is simply stated that an increased severity in the type of scarlet fever has been observed. (Dr. G. Lilico, of West Hartlepool, finds that this change is only true of adult patients.) A certain number of reporters, however, refer to particular manifestations of this increased severity. In the two following replies the enhanced severity refers to the acute attack.

"There was a distinct tendency during 1920 to a more severe form especially as regards rash, throat conditions and desquamation. Complications were, however, uncommon and there was no mortality." (Dr. W. Garstang, Hucknall U.D.).

"During the last two years there has been a tendency towards a slightly more profuse and brighter rash with more definite initial illness; the course of the disease, however, is not apparently more severe." (Dr. A. E. Jerman, Erith U.D.).

Then a few reporters refer to the recurrence of a toxic or malignant type of scarlet fever and to the examples quoted above may be added the experience of Dr. T. Howard, Portland :—

"In 1909 a very virulent outbreak occurred which was confined to one small area of my district. The total number of cases was 24 and there were 12 deaths . . . From my experience of this outbreak I should say that this type of disease requires to be as firmly dealt with as confluent smallpox."

Dr. T. B. Smith (Abertillery U.D.) writes :—

"Recently there was a tendency to assume a more malignant form and so far this year we have had two cases of malignant scarlet fever . . . The most frequent complication in my opinion was a severe anæmia most marked at the end of the third week."

A higher case mortality rate is specially mentioned by three reporters. Dr. W. H. T. Winter writes: "My impression was

that epidemics had become less virulent, but the following table does not confirm it :—

TABLE 5.

Tettenhall, Staffs. : FATALITY RATES.

Period.	No. of cases.	No. of deaths.	Fatality rate.
1883–1893	61	2	3·27
1893–1903	256	10	3·90
1903–1913	307	3	0·97
1913–1923	91	4	4·39 "

Dr. H. Lawrie, Ramsbottom U.D., states that in 1923 there were four deaths out of 59 cases, and Dr. J. D. Ingram thinks that the rising number of deaths from scarlet fever in Crewe suggests that " the severity of the disease is about to increase slowly."

A considerable percentage of complicated cases is the evidence of unusual severity noted by Dr. R. Carmichael (Weetslade U.D.), Dr. W. Nicholl (South Shields), Dr. W. F. Corfield (Colchester), Dr. A. D. Crofts (New Windsor U.D.), Dr. R. Ll. Williams (Mountain Ash U.D.), Dr. J. E. Pemberton (Buckingham U.D.), Dr. F. A. Belam (Brighouse), Dr. R. B. Berry (Gloucester C.B.).

At Colchester, since 1919, Dr. Corfield reports " as a rough estimate " that " 25 per cent. of the scarlet fever cases have been mild and without complication ; 50 per cent. have had some complication (chiefly enlarged secondary glands or occasionally otitis media) and some 10 per cent. have been severe cases."

Among the particular complications mentioned are otitis, nephritis, rheumatism, enlarged glands, septic sequelae, rhinitis, cardiac dilatation, anaemia. As regards renal complications, Dr. Berry, of Gloucester, writes :—

> " Scarlet fever has been present in Gloucester since I came and during the winter months there occurred a number of cases of quite a severe type. A large majority suffer from albuminuria of varying degree—a few having definite nephritis."

Dr. Grindley, Kingswinford R.D., has " noticed that cases occurring in dirty, and especially overcrowded houses, are more severe, particularly with regard to throat symptoms."

(3) THE EFFECT OF HOSPITAL ISOLATION AND TREATMENT UPON THE PREVALENCE AND MORTALITY OF SCARLET FEVER.

(a) *Effect of Hospital Isolation upon Prevalence.*

In the previous section we have not referred in detail to the opinions expressed by our informants as to the means of spread of scarlet fever because of the difficulty, if not impossibility, of determining the relative importance of the various methods. There is considerably less ambiguity in the interpretation of answers

dealing with general end-results, such questions, in fact, as are now under consideration. The answers may be said to summarise the impressions made on the minds of competent observers of long practical experience.

In Table 6 we have summarised the answers.

TABLE 6.

Opinions concerning the EFFECT OF HOSPITAL ISOLATION *and treatment on the* INCIDENCE *of Scarlet Fever.*

Effect of Hospital Isolation.	London.	England.			Wales.	Totals
	Met. Boroughs.	Urban.	Rural.	Combined Districts.	Urban and Rural.	
Incidence greatly reduced ..	—	41	14	2	9	66
,, reduced	2	108	39	4	5	158
,, sightly reduced ..	—	5	4	2	1	12
,, probably reduced	—	17	9	2	1	29
,, favourably affected	1	68	19	11	5	104
Totals	3	239	85	21	21	369
Little or very little effect ..	2	27	18	7	—	54
Doubtful or very doubtful effect	—	12	2	2	—	16
No effect	6	101	19	5	10	141
Incidence increased	1	3	—	2	—	6
Totals	9	143	39	16	10	217
"Cannot say"; "have no opinion to offer," etc. ..	2	75	38	17	8	140

On the whole, and apart from the unknown bias of those who do not offer an opinion, it will be seen that in the opinion of the majority of reporters hospitals have helped in some degree to lessen the incidence of scarlet fever. It is not always certain that the opinions expressed are exclusively related to the district under review and are not generalisations; but, on the other hand, many give statistics in support of their contention that scarlet fever prevalence in their hospital-served districts is low. The positive answers are qualified in some instances and one of the most frequent comments is that hospital isolation succeeds only if the first cases of a potential epidemic come quickly under its influence; others (such as the Medical Officers for Ealing, Great Yarmouth and Tamworth) remark that hospitals only curtail the prevalence of scarlet fever during inter-epidemic times. Dr. Howard Jones (Newport), on the contrary, thinks that hospital isolation has "tended to flatten out epidemic peaks" and Dr. Pringle (Ipswich) states that hospital isolation "definitely helps to control the

establishment of epidemics." Two observers consider that while hospitals have not diminished the prevalence of scarlet fever in their districts as a whole it has reduced the number of cases per infected house. Dr. Sharpe (Preston) says that the old prevalence has been undoubtedly reduced but that "the missed mild case and the carrier are responsible for its maintenance in epidemic form." "To a disappointing extent, beneficially," is the answer of Dr. Pattin (Norwich), and possibly this is the opinion of some others who state that only a slight reduction in prevalence can be traced to the intervention of hospitals. Among the larger districts whose medical officers consider there has been a greatly reduced incidence of scarlet fever as the result of hospitals may be mentioned:—Bedford, Plymouth, Gateshead, South Shields, Canterbury, Sandgate, Heywood, Wembley, Mansfield, Barnes, Rothwell, South Crosland, Rhondda and Swansea.

It will be noticed from Table 6 that the majority of Metropolitan Health Officers consider that hospital isolation has had little or no effect upon the prevalence of the disease and Dr. Annis thinks "it (prevalence) is probably extended in an epidemic period." Other reporters, who consider that hospital isolation has increased, or may increase, the prevalence of scarlet fever, are Dr. Forman (Scalby), Dr. Pickford (Little Lever), Dr. Sisam (writing of the Abingdon districts) and Dr. O'Connor (Leicestershire Combined District). In Dr. Duncan Forbes' opinion hospital isolation "prevents spread in families occasionally but does not lessen the spread of disease throughout the district; on the contrary, because of the increased infectivity of patients nursed with others in hospitals, hospital isolation probably leads to higher incidence." Dr. Steele (Abergavenny R.D.) considers that hospital isolation has converted scarlet fever from an epidemic into an endemic disease.

Among those who think hospitals have had no beneficial effect on the incidence of scarlet fever are some, again, who consider they fail indirectly because they often do not receive the first cases. Thus Dr. Blease (Knutsford) states that "one concealed or overlooked case will do more to spread the disease than any amount of hospital isolation will do to prevent it." Dr. Porter (Reigate) also thinks that hospitals fail to prevent spread because the sources of infection are not fully recognised; he believes, further, that hospitals have more influence in rural districts, where "carriers" are not so common. Dr. Ramsbotham (Tendring R.D.) also believes that hospital isolation is especially useful and economical in country districts, when the first cases can be promptly isolated in this way.

It will be noticed in the table above that a comparatively large proportion of the medical officers in charge of Combined Districts abstain from giving an opinion even though they have, perhaps, more opportunities than most for making a comparison between districts where hospital and home treatment, respectively, obtains.

(b) *Effect of Hospital Isolation on the Mortality.*

The answers to this part of the question are summarised in Table No. 7 below.

TABLE 7.

Opinions concerning the EFFECT OF HOSPITAL ISOLATION *and treatment on the* MORTALITY *from Scarlet Fever.*

Effect of Hospital Isolation.	London.	England.			Wales.	Totals
	Met. Boroughs.	Urban.	Rural.	Combined Districts.	Urban and Rural.	
Mortality greatly reduced ..	—	19	3	2	2	26
,, reduced	3	72	23	5	2	105
,, slightly reduced ..	—	4	3	—	4	11
,, probably reduced	—	6	4	2	—	12
,, favourably affected	1	29	6	2	3	41
Totals	4	130	39	11	11	195
Little or very little effect ..	—	20	9	1	1	31
Doubtful or very doubtful ..	—	6	1	1	—	8
No effect	1	99	35	6	4	145
Mortality increased	—	1	—	—	—	1
Totals	1	126	45	8	5	185
"Cannot say," "no observations," etc., etc. ..	1	110	55	25	12	203

Comparing the table above with Table 6 it will be noticed that the second part of Question 3 is not answered so frequently as the first part and that a larger number of reporters state that they are unable or disinclined to give an opinion; a large proportion of medical officers for Combined Districts again come into this latter group. Opinion is nearly equally divided between those who consider that hospital treatment has lessened the mortality from scarlet fever and those who think the contrary; in sixteen answers only was the opinion expressed that a lessened mortality might be due to other causes than the provision of hospital treatment.

(c) *Effect of Hospital Isolation and Treatment on the Fatality.*

The answers to this part of the question are summarised in Table 8.

TABLE 8.

Opinions concerning the EFFECT OF HOSPITAL ISOLATION *and treatment on the* FATALITY *of Scarlet Fever.*

Effect of Hospital Isolation.	London.	England.			Wales.	Totals
	Met. Boroughs.	Urban.	Rural.	Combined Districts.	Urban and Rural.	
Fatality greatly reduced ..	1	17	6	2	1	27
,, reduced	2	70	20	4	6	102
,, slightly reduced ..	—	4	3	1	—	8
,, probably reduced ..	—	16	6	2	—	24
,, favourably affected	—	33	3	4	3	43
Totals	3	140	38	13	10	204
Little or very little effect	—	16	6	2	—	24
Doubtful or very doubtful effect	—	7	3	1	—	11
No effect	—	93	33	5	3	134
Fatality increased	—	1	—	—	—	1
Totals	—	117	42	8	3	170
"Cannot say," "no information," etc., etc. ..	—	99	53	25	11	188

From this table it will be seen that of those reporters who express an opinion there is a slight majority who believe that hospital treatment has helped to reduce the case-mortality of scarlet fever. Among the others, eight reporters express in their answers a doubt whether hospitals should be credited with the lessened fatality rate, while fifteen reporters suggest that the rate has declined because the type of the disease has become milder.

(d) *Influence of Hospital Isolation and Treatment upon the Occurrence of Complications.*

The answers to this last part of Question 3 were more varied than usual and are summarised in Table 9.

TABLE 9.

Opinions concerning the EFFECT OF HOSPITAL ISOLATION *and treatment upon the occurrence of* COMPLICATIONS.

Effect of Hospital Isolation.	London.	England.			Wales.	Totals
	Met. Boroughs.	Urban.	Rural.	Combined Districts.	Urban and Rural.	
Complications greatly reduced	—	12	6	1	—	19
,, reduced ..	3	61	17	5	4	90
,, slightly reduced	—	2	2	—	—	4
,, probably reduced ..	—	8	1	2	—	11
Favourable effect	—	24	8	2	4	38
Totals	3	107	34	10	8	162
Little or very little effect ..	—	5	2	7	1	15
Doubtful effect	—	9	4	2	—	15
No effect	1	63	23	5	3	95
Complications increased ..	2	20	2	2	1	27
,, probably increased ..	—	1	—	—	—	1
,, increased when hospital is overcrowded ..	—	21	3	—	—	24
Totals	3	119	34	16	5	177
"Cannot say," "no information," etc., etc.	6	143	67	17	15	248

Here, again, a general glance at the table above shows that opinion is almost evenly divided upon the question of how the incidence of complications is affected by the hospital isolation and treatment of scarlet fever; at the same time it should be noted that 42 per cent. of the reporters prefer to express no opinion on this part of the subject.

On comparing the last four tables, it will be seen that, where complications are concerned, there is some suggestion that hospital isolation has proved harmful. The total number of reports, however, in which hospitals are, in various circumstances, incriminated is small (52), and in nearly half of this number the charge is only meant to apply when the ward accommodation is overtaxed; among the remainder it is frequently stated that complications are more common in hospitals than in home treated cases. Thus Dr. Jenner (Stockport) writes: "It is doubtful whether hospital treatment has in any way lowered the occurrence of the complications mentioned. I have consulted with many medical men in this Borough, and they seem to be of the same opinion as myself, that complications are much less in home treatment." A similar

opinion, it may be noted, is comparatively common in the Lancashire reports. Opinions regarding particular complications are seldom offered, but it is interesting to find that by nearly all the reporters who make such references it is considered that otitis has become more prevalent, while rheumatism and nephritis have both become rarer.

Table 10 below is compiled from the previous tables and classifies broadly the answers to each section of Question 3.

TABLE 10.

Summary of opinions expressed concerning the EFFECT OF HOSPITAL ISOLATION *and treatment upon Scarlet Fever.*

Effect of Hospital Isolation and Treatment.	Beneficial.	Little, or none.	"Cannot say."	Totals.
On the incidence of scarlet fever	369 (51 per cent.)	217 (29 per cent.)	140 (20 per cent.)	726
On the mortality from scarlet fever	195 (33 per cent.)	185 (32 per cent.)	203 (35 per cent.)	583
On the fatality of scarlet fever	204 (29 per cent.)	170 (31 per cent.)	188 (40 per cent.)	562
On the occurrence of complications in scarlet fever.	162 (28 per cent.)	177 (30 per cent.)	248 (42 per cent.)	587

In Table 11 are copied the answers to each part of Question 3 which were received from 25 of the largest County Boroughs in England and Wales.

TABLE 11.

Opinions expressed by the Medical Officers of Health of 25 County Boroughs concerning the INFLUENCE OF HOSPITAL TREATMENT AND ISOLATION *on the natural history of Scarlet Fever.*

Medical Officer, County Borough and Population.	(*a*) Prevalence.	(*b*) Mortality.	(*c*) Fatality.	(*d*) Complications.
J. Robertson, Birmingham.* 919,444.	"I do not think there is any evidence of reduced prevalence."	"There is no doubt that the type of scarlet fever is milder than it was 30 years ago, but whether this is due to hospital isolation or not I cannot say."	"I think the hospital isolation has had something to do with the reduction of case mortality but it is difficult to say how much because of the alteration in type."	"There are many less complications and the complications are less severe. This may be due to hospital isolation. Partly it is due to the mild type of disease."
E. W. Hope, Liverpool. 802,940.	"The extensive epidemics which recurred every four years have ceased since the use of Municipal Isolation Hospitals (1886). . ."	"The reduction in mortality from 135·0 per 100,000 in 1856–65, 159·9 in 1866–75, and 78·1 in 1876–85, to 8·9 in 1920, and 5·5 in 1921, coincides largely with the use of city isolation hospitals. . ."	"The fall in fatality from 16·6 per cent. in 1890 to 1·5 per cent. in 1921 is noteworthy. To some extent this is undoubtedly due to increased notification of cases, especially the rapid fall in 1890–92."	"Reduction in fatality has undoubtedly been accompanied by reduction in complications."

* It is interesting to note here the following opinions, recently expressed to us, by Dr. E. H. R. Harries, Medical Superintendent of Birmingham's City Hospital for Infectious Diesases :—

"I think it is a fair statement that case mortality in scarlet fever is, on the whole, not influenced by the removal of patients to hospital. I am not, however, so clear upon the point of late complications. The average case of scarlet fever will settle down in a few days from onset, whether treated at home or in hospital, but I am not satisfied that the early detection and treatment of late complications is likely to be so satisfactorily carried out in the average industrial home as in hospital. After all, the medical problem of scarlet fever is one not of mortality, nor of immediate morbidity, but of morbidity, e.g., heart and kidney involvement, which manifests itself between the second and third week."

R. Veitch Clark, Manchester. 730,307.	"There is no evidence that isolation has materially affected the prevalence of this disease."	"Both the general and the case mortality have markedly fallen since hospital treatment was instituted, especially the latter, which is an important figure. There appears to be no other definite attributable cause for this result than hospital isolation and treatment apart from the possible gradual immunisation of the community."		
J. Johnstone Jervis, Leeds. 458,232.	"Has no effect in diminishing the number of cases."	"General mortality decrease 4·6 per cent., scarlet fever mortality decrease 37·5 per cent. (Figures taken on an average of two 10-yearly periods)."	"Reduced considerably." 1890 = 17·3 per cent. 1923 = 1·4 per cent.	"In 1922, 7·5 per cent. of hospital-treated cases suffered permanent damage of one kind or other, whilst 13·8 per cent. of home-treated cases were similarly crippled."
D. S. Davies, Bristol. 376,975.	"The actual numerical dimensions are probably not much influenced by hospital isolation."	"General mortality is probably lessened as the more severe cases are put under hospital treatment."	"Fatality is in my opinion lessened for same reason as in (*b*)."	"The influence of hospital isolation is also favourably engaged to these complications."
C. Sanders, West Ham. 300,860.	"To no extent."	"To scarcely any extent."	"? Favourably. I am of opinion case-mortality would be greater in the borough without hospital."	"No data obtained by Medical Officer of Health."

TABLE 11—*continued.*

Medical Officer, County Borough and Population.	(*a*) Prevalence.	(*b*) Mortality.	(*c*) Fatality.	(*d*) Complications.
J. Wright Mason, Kingston-on-Hull. 287,150.	"Hospital isolation has been the means of removing the source of infection from amongst the other occupants of the house, thereby limiting the spread of the disease; thus reducing the prevalence."			
J. J. Buchan, Bradford. 285,961.	". . . Hospital isolation has in my opinion reduced the prevalence''	"It has reduced scarlet fever mortality."	"It has reduced the fatality rate."	"It has reduced the frequency of some complications but not of all, it has ameliorated those that have occurred."
H. Kerr, Newcastle-on-Tyne. 275,009.	"Although I cannot prove the fact, I am convinced that, while there is no extraordinary fall in incidence, one might reasonably have expected an increase with growing urbanisation, but this has not taken place. On the other hand, I am convinced that the segregation of practically all the virulent types of cases has been of the utmost importance in the reduction of case mortality and general mortality."			"These are on the whole less common and less severe than in former years and one never sees a bad septic case to-day. These septic complications always show a case-percentage incidence proportional to the congestion of the ward accommodation."

G. Petgrave Johnson, Stoke-on-Trent. 267,597.	"I have formed no opinion on this point."	See (*a*)	See (*a*)	See (*a*).
P. Boobbyer, Nottingham. 262,624.	"Very little."	"Very little."	"I am of opinion that open-air treatment as practised at the City Isolation Hospital has been instrumental in reducing both the fatality and the liability to septic complications."	
A. Mearns Fraser, Portsmouth. 247,284.	"I do not think that hospital isolation has reduced the prevalence."	"It has not affected it."	"Has not affected it."	"Complications appear to me to be more prevalent in hospital than in home isolation."
C. Killick Millard, Leicester. 234,143.	"I doubt if it has reduced it."	"I believe that this has fallen independently of hospital isolation."	See (*b*).	"Cannot say—have very few."
R. M. F. Picken, Cardiff. 219,580.	"I have no opinion."	"I have no opinion."		
O. Hall, Plymouth. 210,036.	"Considerably diminished."	"Reduced."	"Reduced."	"Reduced."
H. P. Newsholme, Croydon. 190,684.	"Experience elsewhere leaves me with the impression that the prevalence has not been markedly affected by hospital isolation."	"I think that the general mortality has been materially decreased by hospital isolation and that the same applies to the fatality."		"I think that these are more common in hospital cases than in those nursed at home."

TABLE 11—*continued*.

Medical Officer, County Borough and Population.	(*a*) Prevalence.	(*b*) Mortality.	(*c*) Fatality.	(*d*) Complications.
C. W. Paget Moffatt, Bolton. 178,683.	"I do not feel able to express an opinion."	"I cannot say."	"The worst cases are sent to hospital. This makes comparison between hospital and home-treated cases misleading."	"Impossible to say. Scarlet fever is now of a very mild type."
R. E. Lauder, Southampton. 160,994.	"Isolation undoubtedly prevents the spread of the disease."	"The decrease in the scarlet fever mortality is greater than in the general mortality."	"The case mortality has fallen since hospital isolation was started."	"As nearly all the severe cases that occur in the borough are admitted, the milder cases being left at home, the occurrence of complications is certainly reduced, provided the administrative measures at the hospital are good."
H. Renney, Sunderland. 159,055.	"Not at all."	"Both have been reduced." (Scarlet fever mortality and general mortality).	"Case mortality has certainly been reduced."	"Removal to hospital, whilst probably not preventing the complications, often ensures a satisfactory termination."
W. Benton, East Ham. 143,246.	"Been reduced."	"Reduction."	"Reduction."	"Reduction."

D. Forbes, Brighton. 142,709.	"Prevents spread in families occasionally, but does not lessen the spread of disease throughout the district; on the contrary, because of the increased infectivity of patients nursed in hospitals, hospital isolation probably leads to a higher incidence."		"No good effect."	"Cannot judge."
C. V. Dingle, Middlesbrough. 131,070.	"I am of the opinion that it has kept the disease under control. Except for decennial outbursts we do not have an excess of scarlet fever considering the large number of children in our population."	"Has had a favourable effect."		
A. E. Brindley, Derby. 129,796.	"... I am of opinion that there is no evidence that hospital isolation has diminished in any appreciable degree the prevalence in the town as a whole."	"Doubtful."	"Probably some lives saved, but few in number, serious cases being rare."	"I am of opinion that more cases of otitis and otorrhœa will occur in hospital-treated cases than in home cases, unless ample accommodation is available or open-air treatment given. Nephritis and rheumatism have been comparatively rare in Derby Hospital."

TABLE 11—*continued.*

Medical Officer, County Borough and Population.	(*a*) Prevalence.	(*b*) Mortality.	(*c*) Fatality.	(*d*) Complications.
E. H. Snell, Coventry. 128,157.	"Apparently not at all."	"This has gone down, but it is not certain that it is due to hospital isolation."	See (*b*).	"Complications do occur amongst cases nursed at home, but it is probable that ear and nose troubles are more frequent in hospital cases."
W. Allen Daley, Blackburn. 126,922.	"Inappreciably."	". . . The great reduction in mortality appears to be due to a change in the type of the disease which will probably become more virulent again with the passage of time."		"Rheumatism and nephritis appear to be independent of hospital or home treatment. Overcrowding in hospital increases ear complications."

(4) Return Cases and Domestic Overcrowding.—(*M.O.H. forms* : *Sect. B. Q.*5).

The question addressed to medical officers of health on this subject was "Have you any data establishing a possible connection between the occurrence of 'return cases' and overcrowding in the houses concerned?" In over 90 per cent. of the reports this question is answered by a brief negative, or more briefly still by a blank space; not a few reporters say that they have no records of return cases, or that such cases are very rare. Twenty-six reporters express the opinion that no connection exists between the occurrence of return cases and overcrowding in the home, while forty-one consider that there is such a connection. Here, again, data are rarely forthcoming, but such figures as are given in support of one or other contention are quoted below together with the few opinions offered on the subject.

(a) *Opinions and figures in favour of there being no connection.*

In Liverpool it is considered that "return cases are wholly irrespective of overcrowding." It is further stated that in the most overcrowded houses many of the children are protected by a previous attack, and that the proportion of susceptible children is highest in the best housed families. In Peterborough Dr. Johnstone considers that return cases are commoner in small families where the eagerly looked-for return of the hospital convalescent means a closer companionship between two children, for example, than that which ensues in a large family where the child that was removed to hospital has hardly been missed. In Derby, return cases are rare in houses where the patient is treated at home, because only in houses that are not overcrowded is retention allowed. In Bedford, Dr. Phillips finds that the return cases occur in the small homes of artisans which are not as a rule overcrowded.

Two reporters consider that the occurrence of return cases is not governed by extrinsic circumstances but is due to the special infectiousness of the convalescent or to the special susceptibility of his companion. Dr. Wilkinson (Oldham) considers that hot baths on the day of discharge and the non-disinfection of the patient's Sunday clothes account for return cases.

Dr. Stalker (Burnley) states "return cases would not appear to have any more marked relationship with congestion than with normal conditions"; Dr. Bateman (Folkestone) says there is "certainly nothing to suggest a connection with overcrowding in the houses concerned."

In Chatham, during 1922 and 1923, it was found that, while secondary cases are more common in overcrowded houses, "return cases" are not so.

Dr. D. S. Davies supplies a useful statistical summary of his observations in Bristol where, during the years 1913 to 1922

inclusive, 79 return cases were reported. These cases involved 70 houses with an aggregate number of rooms amounting to 407. In these rooms were accommodated 457 persons; so that—if 2 persons per room be taken as the minimum standard of dangerous congestion—the return cases at Bristol cannot be considered, in bulk at any rate, to have been associated with domestic overcrowding.

In CARLISLE it is reported that of 25 return cases 11 occurred in overcrowded (more than 2 per room) houses and 14 in non-overcrowded houses.

For LEEDS Dr. Jervis gives the following figures :—

In 1919 16 per cent. of the return cases came from overcrowded houses
„ 1920 13 „ „ „ „ „ „ „ „ „
„ 1921 9 „ „ „ „ „ „ „ „ „
„ 1922 10 „ „ „ „ „ „ „ „ „
„ 1923 18 „ „ „ „ „ „ „ „ „

The table below, supplied by Dr. Jenner (Stockport), shows that, out of 22 return cases during the period 1919 to 1923, five came from homes where the number of persons per room amounted to 2 or over.

TABLE 11A.

Stockport.—RETURN CASES.

Year. No. of cases notified No. removed to hospital.	Return cases.	No. of rooms.	No. of occupiers. Ages. Over 15	No. of occupiers. Ages. Under 15	Total occupiers.	Persons per room.
1919.						
No. notified 418 ..	No. 1	6	4	2	6	1 person.
No. removed 290 ..	No. 2	5	2	6	8	1 „
	No. 3	4	2	4	6	1½ „
	No. 4	4	2	5	7	1¾ „
1920.						
No. notified 762 ..	No. 1	4	3	6	9	2¼ persons.
No. removed 510 ..	No. 2	4	4	6	10	2½ „
	No. 3	4	4	6	10	2½ „
	No. 4	4	3	2	5	1¼ „
	No. 5	6	2	4	6	1 „
	No. 6	4	3	2	5	1¼ „
	No. 7	4	2	2	4	1 „
	No. 8	5 and shop	2	2	4	⅘ „
	No. 9	do.	2	2	4	⅘ „
	No. 10	4	2	2	4	1 „
	No. 11	4	2	4	6	1½ „
	No. 12	4	2	4	6	1½ „

Year. No. of cases notified No. removed to hospital.	Return cases.	No. of rooms.	No. of occupiers Ages.		Total occupiers.	Persons per room.
			Over 15	Under 15		
1921.						
No. notified 412 ..	No. 1	2	2	3	5	2½ persons.
No. removed 285 ..	No. 2	5 and shop	2	2	4	⅘ ,,
1922.						
No. notified 207 ..	No. 1	4	3	6	9	2¼ persons.
No. removed 144						
1923.						
No. notified 238 ..	No. 1	4 and shop	2	2	4	1 person.
No. removed 174 ..	No. 2	4	2	3	5	1¼ ,,
	No. 3	7	3	2	5	⅝ ,,

In CHICHESTER during 1915 there was one return case and this occurred in an overcrowded home; in 1916 there were 2 such cases and these were unconnected with any overcrowding.

(b) *Opinions and figures in favour of there being a connection.*

Dr. Boobbyer (Nottingham): "Return cases certainly more common in poor and overcrowded districts than elsewhere."

Dr. Renney (Sunderland): "Large number of return cases in overcrowded houses."

Dr. Gilmour (Wimbledon): "Return cases more common since overcrowding has become more marked."

Dr. Kerr (Newcastle-on-Tyne): "The higher the proportion of inhabitants of rooms the greater the liability to return cases."

Six reporters state that in their experience return cases are nearly always due to the fact that the convalescent shares a bed with other children on his return from the hospital.

Some figures supplied by Dr. Hutt show that in Holborn there was very bad overcrowding in 6 out of the 11 houses where return cases occurred. Thus:—

In house	No. 1	there were	2	adults and	4	children living in	1	room.
,,	,,	No. 2	,,	,,	1	,,	,,	3	,,	,,	,,	1	,,
,,	,,	No. 3	,,	,,	1	,,	,,	2	,,	,,	,,	1	,,
,,	,,	No. 4	,,	,,	4	,,	,,	3	,,	,,	,,	2	rooms.
,,	,,	No. 5	,,	,,	2	,,	,,	6	,,	,,	,,	2	,,
,,	,,	No. 6	,,	,,	2	,,	,,	3	,,	,,	,,	2	,,

Particular interest in this subject was shown by Dr. F. T. H. Wood (Bootle), who examined his scarlet fever inquiry returns

for 1924 in order to make comparisons of the housing conditions in those patients who gave rise to a secondary or a return case. Dr. Wood included the results of this investigation in an appendix to his questionnaire report of which the following is an abstract :—

> "In all, 322 notifications of scarlet fever were investigated; they occurred in 275 dwellings, and in 36 cases a primary case was followed by a secondary or a return infection. Taking the group in which there was a single infection only it was found that there were 702 children under the age of 14, of whom 420 could be considered as really at risk from the fact that they had not previously suffered from an attack of scarlet fever, and the average number of persons per room (including children over 14 and adults) in this group was 1·32. In the group of 36 secondary or return cases, the total persons under 14 numbered 130, of whom 56 were really at risk owing to their not having previously suffered from an attack of scarlet fever, and the average number of persons per room (including children over 14 and adults) in this group was 1·46; not a large, but probably a significant, difference from the first group considered. That the total number of persons per room is the significant factor, and not the total number of susceptible persons per room, emerges from the fact that in the former group consisting of single infections only the average number of susceptible children per room was 0·36, somewhat greater than the figure of 0·31 in the group comprising the secondary or return cases.
>
> Similar results were obtained from the examination of scarlet fever notifications during 1923, and the figures, although small, point to the conclusion that the risk of infection in scarlet fever is greater in overcrowded dwelling-houses—an apparently obvious conclusion but one which has been challenged recently by certain investigators."

So far, our analysis has been confined to an analysis of *opinions*; we have not ourselves made any direct study of the data provided by the recorders. Such an analysis has, however, been carried out in the Ministry, the technical details of which will be found in a report (see Appendix A) drawn up under the supervision of Dr. Major Greenwood, a member of the Committee. Dr. Greenwood and his collaborators have applied to the data collected in this investigation the methods of analysis used by the eminent statistician Professor Karl Pearson* in his memoir (written in conjunction with Miss E. M. Elderton) on the influence of Hospital Isolation upon Diphtheria. For the purposes of the analysis 46 County Boroughs and 48 Urban Districts were available, and the data were examined in three series, for the years 1906–10, 1911–15, and 1919–23. The statisticians have been unable to demonstrate any significant relation between hospital isolation and prevalence, mortality or fatality of scarlet fever. There is, then, no direct statistical evidence that isolation has been an advantage in general. This is, of course, a statistical —i.e. an average—result; it does not preclude the possibility that in certain areas isolation may have been of value in all three respects. But in a general assessment of the balance of advantage, which is one of our principal duties, this average result is of weight and concordant with the impression created by the division of opinions among the observers.

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* Biometrika, 1914-15, x, 549. (See also Ref. No. 38.)

Dr. Greenwood has also examined statistically the relation between the length of average stay in hospital and the proportion of infected cases discharged (vide infra). For the purpose of this enquiry, the data were of course relatively scanty, owing to the lack of uniformity of definition of an infecting case. However, 23 hospitals contributing in all 256 years of observation had adopted the same definition, viz., a case followed by another case in the same family within 28 days of discharge. Analysis of these data showed that there was a positive correlation between length of average stay and percentage infecting rate, i.e., the longer the average stay, on the average, the greater the proportion of infecting cases. Individual study of the statistics of three hospitals, Norwich, Bedford and Blackburn, furnishing long series of observations pointed in the same direction. Statistical analysis supports, pro tanto, the view of those observers who thought that long retention in hospital tended generally not to diminish but even to increase the frequency of occurrence of infecting cases.

Without unduly emphasising the results of a statistical analysis which, as Dr. Greenwood points out, is beset with difficulties, we think the balance of evidence points (1) to the conclusion that isolation has not in general influenced greatly either the prevalence or the mortality of scarlet fever in this country ; (2) that prolonged retention in hospital, as a routine measure, does not diminish the frequency of home re-infection.

B. Circumstances which govern the Question of Removal of Patients to Hospital. (*M.O.H. forms : both issues, Sect. B., Q.*5.)

The replies to Question 1 of Section B show that a preponderating majority of health officers are, as a general rule, in favour of removing scarlet fever patients to hospital. About 25 per cent. of the reporters state that they consider removal to hospital is always advisable and such advocates are strongly represented in the Metropolitan Boroughs (10 out of 18) and in the industrial areas of Lancashire and Yorkshire. The circumstances which are most frequently considered to make hospital isolation and treatment advisable are as follows :—

1. Insufficient facilities for isolation in the home.
2. Other children in the house.
3. Overcrowding in the house.
4. No proper home-nursing available for the case.

Lack of room and other facilities for isolating the patient is by far the commonest reason given, as regards both urban and rural districts, and occurs in over half the total number of answers. Removal to hospital is considered imperative when the conditions mentioned above are aggravated ; when the case is a serious one ; when other members of the family are engaged either at home or outside in dairy work, shopkeeping, dressmaking, laundry, and other social occupations.

The contingent circumstances less often mentioned, as those in which cases should be sent into a hospital, are set out below in the order of frequency with which they are mentioned.

1. Poor social conditions, poverty, etc.	94	times mentioned.
2. Cases occurring in hotels, boarding houses, schools, etc.	62	,, ,,
3. Impending or recent confinement in the home	58	,, ,,
4. Overcrowded district	32	,, ,,
5. In houses where live public servants such as teachers, postmen, midwives, librarians, railway porters, police and others	35	,, ,,
6. Where home treatment involves financial strain (extra food for patient, loss of work by parents or other members of family)	26	,, ,,
7. Where cases occur in a district previously free from the disease	23	,, ,,
8. Ignorance of parents or guardians	22	,, ,,
9. At wish of parents or guardians	18	,, ,,
10. Other cases of illness (especially surgical cases) in the house	14	,, ,,
11. Where the prosperity of a town is dependent on visitors ...	12	,, ,,
12. Because the practitioner wishes removal	12	,, ,,
13. Houses with a common backyard	7	,, ,,
14. Cases occurring in tents, vans, sheds, etc.	6	,, ,,
15. Where two or more cases occur simultaneously	4	,, ,,
16. If the patients are visitors	3	,, ,,

From a consideration of the various circumstances which at present appear to influence medical officers of health in the matter of removal to hospital, it seems that the social and economic conditions of the patient's home, quite as much as, if not more than, the clinical necessities and public health consideration of his case, are the prime motives for removal of scarlet fever patients to hospital. Thus Dr. Brindley of Derby, under Question 16(a), says: "Removal of the patient often relieves a harassed and overworked mother. Parents are relieved of the cost of feeding the patient and of doctor's bills." Moreover, if the matter be probed still deeper, it would appear that most of these unsatisfactory social and economic conditions are due to a shortage of houses, by no means confined to urban districts but existing also in rural districts.

The official attitude adopted towards hospital isolation by the various authorities is evidently due in certain cases to special local conditions and local sentiment. In some of the industrial areas where overcrowding and poverty exist removal to hospital has become a routine measure, while here and there a reporter states that the public or the parents demand the removal to hospital as a right; not infrequently, also, it is stated that the attendant practitioners are too prone towards hospital treatment and do not consider cases on their merits.

Then in certain fashionable seaside places and other holiday resorts the policy regarding removal is evidently influenced by a special regard for the commercial prosperity and reputation of

the town. In Rhyl, for example, removal to hospital is considered imperative "owing to its being a health resort."

On the other hand, in a comparatively small proportion of districts treatment in the home rather than in an isolation hospital is the rule—sometimes from choice, but more often from necessity. The following exceptional answers to Question 1 (Section B) are set out below, but it should be noted that they only represent part of the evidence concerning the question of hospital and home treatment; the remaining part is given in other sections of the questionnaires or in reports accompanying the questionnaires and the question as a whole will be discussed later under Section G. of this report.

REPLIES TO QUESTION 1 (SECTION B), AND STATEMENTS MADE IN OTHER PARTS OF THE QUESTIONNAIRE, WHICH ARE NOT IN ACCORDANCE WITH THE GENERAL SENSE OF THE GREAT MAJORITY OF THE ANSWERS TO THIS QUESTION.

Dr. E. W. Routley (*Aldershot U.D., population* 19,255): "I am not satisfied that in a number of cases isolation and treatment in hospital are essential. I often consider that they could be well treated at home, but public sentiment, and often the wishes of medical practitioners, determine removal."

Dr. U. M. N. Miles (*Bewdley U.D., population* 2,676): "Never if it can be possibly avoided." In last 10 years 27 cases notified; all treated at home.

Dr. S. Richmond (*Dartford R.D., population* 37,216): "Nearly all cases are sent to hospital. Many ought to be treated at home to save expense and with little danger to the community." In last 10 years 1,178 notified.

Dr. J. Robertson (*Darwen M.B., population* 38,720): "In my opinion cases are better nursed at home provided they can have a separate room and be properly nursed under good hygienic conditions and be supervised by the Sanitary Authorities." In 1922 there were 62·3 per cent. of cases nursed at home; in 1923 the percentage was 75.

Dr. F. H. N. Maidment (*Depwade R.D., population* 18,990): "Selected cases only should be sent. Often the cases are sufficiently isolated in their own home." No cases sent to hospital for last 11 years.

Dr. P. S. Blaker (*Dudley C.B., population* 51,079): "I do not consider it advisable in this district. We get very good results from the 'home-nursing' of these cases." In last 10 years there were 1,055 cases notified, and all were treated at home.

Dr. W. W. Jameson (*Finchley U.D., population* 39,419. "Practititioners are ordinarily advised not to send to hospital every case of scarlet fever occurring in their practices." Large proportion of notified cases are sent to hospital.

Dr. F. A. Spreat (*Friern Barnet U.D., population* 14,496): "I am of opinion that the indiscriminate removal of scarlet fever patients to the isolation hospital is to be deprecated. As a general

practitioner it is my experience that home-treated cases do equally well as those treated in hospital, and where it is possible for cases to be treated at home without serious risk of the disease spreading the notified cases should be so treated."

Dr. R. C. Middlemist (*Grantham M.B., population* 19,010). "In this district cases are not removed to hospital except under particular circumstances." In last 10 years there were 260 cases notified and all were treated at home.

Dr. J. S. Sewell (*Horwich U.D. population* 15,616). "I am tending towards the opinion that removal is not necessary on the grounds that the patient cannot be efficiently isolated." At present, however, 70 per cent. of cases are sent to hospital.

Dr. W. Garstang (*Hucknall U.D., population* 17,180). "Only in very exceptional cases where home treatment involves cessation of wages." In last 10 years there were 399 cases notified; all except 2 were treated at home.

Dr. Killick Millard (*Leicester C.B., population* 239,700). "I regard removal of patients to hospital as a convenience rather than as a public health measure of much public health importance."

Dr. J. S. Pickford (*Little Lever U.D., population* 4,922). "Since 1914 we have not considered it advisable or necessary to remove cases of scarlet fever to hospital." Since 1914 all the 112 notified cases have been treated at home by the Milne method.

Dr. G. J. Awburn (*Mottram U.D., population* 2,916, *and Tintwistle R.D., population* 1,983). "I do not think it necessary to remove any case of scarlet fever to hospital. Should an outbreak occur in school I should consider the matter."

Dr. G. L. Clements (*Norman Cross R.D., population* 5,520). "I have no circumstances rendering removal imperative." During 1916–1923 all the 69 notified cases were treated at home.

Dr. E. H. Young (*Okehampton U. and R.D.. population* 18,553). "In my early years a strong supporter of hospital treatment. I must say that during later years I have become more sceptical of its advantages." Hospital at Exeter, 25 miles. In last 10 years all the 190 notified cases were home-treated.

Dr. R. Moreton (*Overton R.D., population* 52,000). "No hard and fast rule possible in an agricultural district." In last 7 years the 47 notified cases all treated at home.

Dr. T. J. McAllen (*Pontypool U.D., population* 6,881). "No circumstances have at present necessitated removal of scarlet fever cases to hospital." In last 10 years all the 230 notified cases home-treated.

Dr. W. W. Jones (*Vaynor and Penderyn R.D., population* 5,674). "Scarlet fever cases are not removed to hospital in this district. If strict isolation is enforced I see little advantage to the public health (in removal to hospital)."

Dr. W. Sisam (*Wallingford U. and R.D.*). "Removal has been the rule ever since the hospital was opened, the exceptions have been mostly well-to-do people. I do not advocate removal as a

routine measure, but there is great difficulty—especially with the medical practitioners—in keeping cases at home when removal has become an established custom."

Dr. F. J. Allan (*Westminster City*). "Many cases could be treated at home, but the public demand hospital treatment."

There remain those districts (mainly rural) where isolation hospitals are either considered inadequate, inconveniently situated, or are lacking altogether; in most of such cases these circumstances are deplored, but in a few instances, such as Okehampton, this is not so. The South-Western Counties (Cornwall especially), Wales and, to a less extent, Norfolk, appear to be the districts least well provided with hospitals for the isolation of infectious disease.

C. Arrangements for securing Admission to Fever Hospitals. (*M.O.H. forms: Sect. B, Q. 2 in both issues.*)

1. Judged by the evidence of such returns as have been received from the *Metropolitan Boroughs*, it would seem that most notified cases of scarlet fever patients in London are isolated and treated in hospital. The table below shows to what extent this was the case in 1923.

TABLE 12.

Percentage of Notified CASES OF SCARLET FEVER REMOVED TO HOSPITAL *from certain Metropolitan Boroughs in* 1923.

Bermondsey ..	99·0 per cent.	Poplar	96·2 per cent.
Camberwell ..	95·0 ,, ,,	St. Pancras ..	98·6 ,, ,,
Greenwich ..	91·0 ,, ,,	Shoreditch ..	97·6 ,,
Hammersmith	98·0 ,, ,,	Southwark ..	98·3 ,, ,,
Islington ..	97·0 ,, ,,	Stepney ..	99·1 ,, ,,
Kensington ..	96·1 ,, ,,	Wandsworth ..	88·0 ,, ,,
Lambeth ..	94·3 ,, ,,	Westminster ..	96·7 ,, ,,
Paddington ..	97·3 ,, ,,	Woolwich ..	96·0 ,, ,,

The table above shows further that it is not only the poorer and more congested boroughs that send a high proportion of their scarlet fever cases to hospitals; the figures for such comparatively well-to-do districts as Kensington and Westminster, for example, are even higher than those for the crowded boroughs of Lambeth and Poplar. It also appears from the replies to the first three paragraphs of Question 2 that removal to hospital is encouraged and facilitated as much as possible by most of the health departments concerned. Thus, it is quite common for the notifying practitioner to arrange directly, and as a regular practice, with the Metropolitan Asylums Board for the reception of his scarlet fever patients; in other cases arrangements are made normally through the Health Department concerned, but

in these circumstances again the practitioner, if necessary, deals directly with the hospital authorities. In Kensington Borough "the Council encourage general practitioners to secure removal at once and not to wait for the medical officer of health or sanitary inspector to remove the case." Moreover, it is the exception for the medical officer of health "to satisfy himself in each instance that the case is one where isolation and treatment in hospital are essential"; the exceptions are provided by Bermondsey, Lambeth and Southwark, and in the latter district a special enquiry officer is employed for the purpose. In Camberwell and Islington investigations are only made at the sanitary inspector's request; and in Kensington, Paddington, Stepney, Westminster and Woolwich, only when, for some reason or other, the case has not been sent to hospital. In most of the boroughs under review the same arrangements are said to hold good in both epidemic and in inter-epidemic periods, but in Bermondsey, Camberwell, Hammersmith and Paddington some selection of cases is made when scarlet fever is epidemic.

In two London Boroughs a note of dissatisfaction is expressed concerning the prevalent practice of leaving the question of removal to hospital in the hands of the notifying practitioner.

Of the arrangements in Greenwich, Dr. E. G. Annis writes :—

> "At present such admission is usually arranged by the medical attendant direct with the Metropolitan Asylums Board, patients being generally removed before the notification is received by the Medical Officer of Health; in some cases difficulty is experienced in obtaining an actual notification of the case from such medical attendant when the (main) object has been achieved by the removal of the patient."
>
> "In this respect (selection of cases for removal) I think there is considerable room for improvement in regard to the administration in London. I think if no case were removed until the Medical Officer of Health of the district concerned either authorised or desired it, it would be far preferable than the existing arrangements. In this way a reasonable selection of cases to be removed could be made in times of extreme pressure."

Dr. G. Clark Trotter, Islington, regrets that under existing arrangements it is difficult to trace patients for the purpose of statistical research into such matters as the incidence of return cases. Dr. Trotter writes :—

> "In London very free facilities are given for the admission of cases to the Metropolitan Asylums Board's Hospitals. The private practitioner, immediately he makes his diagnosis, can 'phone up personally to the Metropolitan Asylums Board and the case is removed. The result very frequently is that the second case is removed to another hospital, not the hospital from which the first case was discharged.
>
> "I have made it a practice of late when the sanitary inspector, as the result of his inquiry, draws my attention to these cases, to write the superintendent of the first hospital informing him of the facts, and I have had letters from the superintendents thanking me for the information. When the second case, as noted, goes to another hospital, the matter is not thus brought immediately under the notice of the hospital medical officer who was responsible for the first case, and, therefore, the possibility of there being 'returns' is not brought vividly before him."

2. The replies from the *extra-metropolitan districts* show that there is considerable variety in the arrangements made for the admission of scarlet fever patients to hospital.

(*a*) By far the most common way of securing admission to hospital in urban and rural districts, but not in combined districts, of England and Wales, is "through the medical officer of health." The quoted words above represent about 20 per cent. of the answers to the first part of Question 2. In the other answers more details are given, and the various methods adopted by medical officers of health may be grouped as follows:—

(i) The Medical Officer of Health having been notified (by post or telephone) of a case of scarlet fever promptly arranges with the hospital for the case to be admitted as soon as possible. In these cases the diagnosis is accepted without question although the Medical Officer of Health may visit the house to decide if removal is necessary or desirable. Some such method as this is probably adopted also by those reporters referred to above who give no details.

(ii) In seventy returns it is stated that the Medical Officer of Health secures admission without any inquiry if the notifying practitioner states that he wishes his patient to be admitted and in some cases such a request is made on the notification form in a space expressly left for the purpose. This method obtains both in urban and rural districts but is only once mentioned in the returns from Wales.

(iii) In sixty-two districts—with no particular grouping—the Medical Officer of Health visits notified cases before deciding upon the question of removal; in a nearly equal number of districts the Sanitary Inspector visits and makes a report upon which the Medical Officer of Health acts.

(iv) In some districts, both in small urban and in rural, it is necessary for the Medical Officer of Health to notify or approach another local authority or medical officer before being able to arrange for the admission of a case from his own district. This occurs, as a rule, in districts possessing no hospitals of their own and in which special arrangements for the reception of fever cases have been made with some local, or hospital, authority in another district. Such circumstances are chiefly reported from Devon, Lancashire, Hants, Yorks and especially from Wales, where application to an outside authority is the most commonly reported method of securing hospital treatment.

(v) In a few cases it is stated that the Medical Officer of Health confers with the notifying practitioner before making any arrangements for admission to hospital.

Another main method by which admission to hospital is secured is that in which the sanitary inspector is chiefly responsible for the necessary arrangements. Generally, this official appears to act entirely on his own initiative, but in some districts he acts in consultation with the medical officer of health or the notifying practitioners after having visited the patient's house. In combined districts the arranging for admission to hospital by the sanitary inspector is the commonest method employed, and it is a comparatively common method in Wales. There is a single instance in which admission is said to be primarily arranged by the health visitor.

In marked contrast with what happens in the Metropolitan Boroughs, it is comparatively seldom in the provincial districts that the medical practitioner arranges with the hospital authorities direct for the admission of his cases. He does so relatively often in the rural and in the combined districts, but the total number of districts in which, normally, direct negotiations between the practitioner and the hospital authorities are said to be carried out is only just over 100. In one district it is stated that all the general practitioners are supplied with hospital admission forms.

There remain to be noted a few districts in which admission to hospital is achieved in unusual ways. Thus, in the Borough of Pembroke, in the urban districts of Leiston-cum-Sizewell, Southwold, Wanstead and in the rural district of Alresford, arrangements are made through the District Council (or through its Clerk); at Leominster admission is gained by an order from the Chairman of the Sanitary Committee. In the urban district of Irthlingborough (Northants) the "consent of Chairman of Council must be obtained before any case is transferred to isolation hospital." At Barnstaple the Hospital Committee is called to consider reports from the medical officer of health and the question of admission or not is decided at the meeting: Dr. H. C. Jonas, the Medical Officer of Health, considers that this procedure involves a needless waste of time. Delay might possibly occur also in two districts where the following arrangements respectively are described:—

(i) "The Health Department notifies Surveyor's Department that a case is required to be removed to hospital. The latter (Surveyor's Department) sends man and horse to hospital where the horse is harnessed to the ambulance. This, with a sister-in-charge, then goes for the case, the hospital matron having been previously notified."

(ii) "By telephoning to matron of hospital and notifying removal, after which an order is taken to the horse-keeper, who proceeds to get the ambulance which is kept at the isolation hospital."

On the other hand, in Manchester, Liverpool, Lathom and Great Crosby, the machinery for removal is quickly started by direct application to the ambulance station. The vehicle used for removing patients is generally stated to be a motor ambulance, and in most districts this appears to be owned by and kept at the hospital; in some cases, however, reference is made to "the Council's ambulance," which is, presumably, kept on Council premises. In a few of the larger cities, such as Manchester and Liverpool, an ambulance section is an important feature of the Health Department's organisation. Other forms of ambulance are rarely mentioned, but horse-drawn vehicles still survive in a few county districts and in four urban districts of Staffordshire. In a country district of Norfolk admission to hospital is usually arranged "in some public conveyance—usually a cab." "A light two-wheeled hand-cart and a pram" apparently meet the needs of a South Coast watering place.

(*b*) From the answers received it appears that in the majority of districts the medical officer of health satisfies himself in each

instance that the case is one where isolation and treatment in hospital are essential. In most instances the reply is briefly "yes," but in others the steps taken to obtain this satisfaction are described. Most usually the medical officer acts upon information provided by the sanitary inspector; in other districts the circumstances of the case are discussed with the notifying practitioner, or the medical officer of health may himself visit the patient's house to decide upon the merits of the case.

In 197 districts it is stated that the medical officer of health does not especially inquire into the circumstances of each case before arranging for its admission to hospital. Here, again, in most of the returns the statement is briefly made—in this instance by the word "no." Among the reasons given in some answers, however, are the following: Removal to hospital is a routine measure in the district under review; the wishes of the notifying practitioner are fulfilled without question; that (in the case of part-time officers) such investigations might be resented by fellow practitioners and that the medical officer of health has no time to make personal inquiries.

In a still smaller number of districts it is reported that the medical officer of health only makes investigations in certain circumstances: these include times of epidemic prevalence when hospitals are pressed for beds, and occasions when the notifying practitioner proposes to treat the case at home.

The answers to Question 2(*b*) are numerically analysed in Table 13 below.

TABLE 13.

Practice as regards INVESTIGATING HOME CONDITIONS *of Patient prior to arranging for Hospital Treatment.*

Nature of answer.	Urban districts, England.	Rural districts, England.	Combined districts, chiefly England.	Urban and rural districts, Wales.
Districts in which enquiries are made	70%	77%	46%	85%
Districts in which enquiries are not made	26%	21%	30%	15%
Districts where enquiries are made in certain circumstances	4%	2%	24%	0%

As a comparison with the Metropolitan Boroughs, 30 large cities and towns, with a population of 100,000 and over, are

tabulated below in accordance with the replies to Question 2(*b*) received from them.

TABLE 14.

Practice adopted in some of the larger cities and towns as regards INVESTIGATING HOME CONDITIONS.

Medical Officer of Health makes enquiries.	Medical Officer of Health does not make enquiries.	Medical Officer of Health makes inquiries in certain circumstances.
Birmingham		
Liverpool		
Manchester		
Kingston-on-Hull		
Bradford	Leeds	
Newcastle-on-Tyne	West Ham	Stoke-on-Trent
Cardiff	Nottingham	Southampton
Plymouth	Leicester	Middlesbrough
Bolton	Oldham	Coventry
Sunderland	East Ham	St. Helens
Derby	Brighton	Wolverhampton
Blackburn		
Gateshead		
Stockport		
South Shields		
Preston		
Southend		
(17)	(7)	(6)

(*c*) In the third paragraph of Question 2 it was asked whether admission to hospital could be arranged otherwise than by the methods described in the first two paragraphs, and in nearly 25 per cent. of the answers the reply was a negative. Where this is so the normal method of securing admission is usually through the medical officer of health. In some instances, and notably where the medical officer of health is also in medical charge of the isolation hospital, it is added that any method of securing admission to hospital without the knowledge and consent of the medical officer of health is strongly discouraged. Urban districts form nearly 70 per cent. of all the districts in which it is stated that no other method except the usual one is adopted. No sort of geographical grouping is apparent. Thus in the West Gloucestershire United Districts admission can only be obtained through the medical officer of health or sanitary inspector and practitioners are told that they will be held responsible for the cost of maintenance of any patients they may have had placed in hospital by any means other than those laid down. In the adjoining Herefordshire Combined District, on the other hand, "admission to hospital is encouraged and is made as easy as possible." In the combined districts it may be noted the negative answers to Question 2 paragraph (*c*) are relatively few, and in most of them there is no

hindrance to practitioners, in special circumstances, arranging for hospital admission in the quickest or easiest way. Sometimes, however, the procedure differs in the various component parts of a combined district, as in Dr. J. E. O'Connor's district in Leicestershire; here, in the Blaby and Hinckley Rural Districts, practitioners deal directly with the hospital authorities, but in the Barrow-on-Soar Rural District sanction of the Health Department is essential. In rare cases, such as Cheltenham, where the isolation hospital is not the property of the municipality, anyone can arrange for the removal of a case by first signing a contract to pay the hospital charges.

In the majority of answers, however, it appears that in exceptional circumstances (times when the Health Department is not accessible, in grave cases, etc., etc.) the notifying practitioner may deal directly with the hospital or through the sanitary inspector. Each of these alternatives is mentioned in nearly an equal number of cases, and in the case of the former it is stated by most reporters that the Health Department should be notified as soon as possible of the action that has been taken. A few answers are quoted below to show what arrangements are made in different places for the prompt isolation and treatment when the circumstances are exceptional or urgent.

BIRMINGHAM.—"The medical superintendent of the hospital has instructions to ask from a doctor who wants a case removed at once what the circumstances are. If they are obviously bad he admits the case at once. If not, he refers it to the Medical Officer of Health. This occurs in the case of patients notified after 6 p.m. and before 9 a.m."

BRISTOL.—"The removal of all patients in the City hospitals is conducted through the Health Department's Central Office; after office hours this procedure is continued by the caretaker, who is in telephone communication with the Medical Officer of Health, ambulance station and hospitals."

BOOTLE.—"In urgent cases medical attendant arranges admission, by telephone, direct with the resident medical officer of the hospital."

LIVERPOOL.—"By notification of medical man to Medical Officer of Health during office hours and, outside these, by telephone message to the ambulance superintendent."

MANCHESTER.—"After office hours during the week-end or on public holiday, removal may be arranged by telegram or telephone to the hospital or ambulance station."

HALIFAX.—"Practitioners arrange with Health Department; when this is closed the telephone is left switched over to hospital extension and the matron makes all arrangements. In this way we can admit cases at any time of day or night within a very short time of receiving request from practitioner."

LEEDS.—"On Sunday and after office hours on weekdays cases are telephoned by the general practitioner direct to the City Hospital where the ambulances are stationed."

BECKENHAM.—"By direct reference to the chief sanitary inspector. Not by application to the hospital authorities."

DARTFORD.—"Hospital authorities do not admit—other than by request of medical practitioner or Medical Officer of Health."

GATESHEAD.—"We are under contract to isolate cases for the Guardians but in each case the Medical Officer of Health visits and

confirms the diagnosis in consultation with the Poor Law Medical Officer. The Medical Officer of Health is responsible and makes all arrangements."

FELLING.—"No arrangement necessary when all cases are removed."

SOUTHAMPTON.—"Particulars of urgent cases occurring after official hours on Sundays or holidays are telephoned direct by medical practitioner to the isolation hospital and the case is removed in the ambulance by the removal officer."

HURSLEY R.D.—"Where payment of £3 3s. per week and £1 1s. for the ambulance can be made, arrangements may be made direct with Medical Officer of Health, Southampton."

CROYDON.—"Notification of patients requiring admission is made either to the Public Health Department or to the hospital as may happen to be more convenient. In either case the Health Department is notified forthwith."

KINGSTON-ON-THAMES.—"Medical practitioners may communicate with hospital direct after office hours and arrange removal in urgent cases, or they may call at the private residence of the Medical Officer of Health or sanitary inspector."

BRIGHTON.—"In this town when, in the evening, doctors request admission of the hospital authorities for urgent cases, the ambulance sent for the patient always calls for, and picks up, the sanitary inspector who is detailed specially for infectious diseases work."

KNUTSFORD U.D. AND BUCKLOW R.D.—"If neither the Medical Officer of Health, sanitary inspector, or his clerk are available, application for removal of a case is made to an officer of the Bucklow Joint Hospital Board."

CASTLE DONINGTON R.D.—Here an alternative method to applying directly to the Blaby Isolation Hospital is "reference to the Clerk of the Isolation Hospital Committee."

(*d*) As regards the last paragraph of Question 2, all except a small minority of reporters state that the same arrangements for admission hold good for epidemic as for inter-epidemic periods. Where the answer is not "yes" it is usually explained that a more stringent selection of cases for admission is made or that the practice of selection—not usually observed—is adopted when there is pressure on the hospital. At St. Helens, on the other hand, it is stated that "more cases are reported direct to the hospital." In one district, Beverley, it is mentioned that the county medical officer is consulted in epidemic times.

D. Hospital Administration.

(1) METHODS OF CONVEYING SCARLET FEVER PATIENTS TO HOSPITAL. (*Hosp. forms: Sect. B., Qs. 1 and 2.*)—See summary of analysis on p. 202.

(2) BACTERIOLOGICAL TESTS. (*First issue, Sect. B. 15; second issue, Sect. B. 7c and 9.*)—In both the first and the second issues of questionnaires the following question was asked: "Have any bacteriological investigations been made concerning the percentage of scarlet fever patients admitted to hospital with diphtheria bacilli in their throats or noses. If so, with what results, and were any virulence tests carried out?"*

* In the first issue the question contained no reference to "noses" and no requests for "results"; apart from this, the question is similar in both issues.

In the second issue information was also asked concerning any rules that might be observed as regards the search for diphtheria bacilli in the throats or noses of scarlet fever convalescents about to be discharged from hospital.

To the first question nearly two-thirds of the reporters replied with a simple negative, and it may be assumed that this answer includes all three parts of the question ; three or four qualify their negative by adding that an examination is only made when a mixed infection is suspected. At Guildford the examination is only made in the case of those patients admitted from localities where diphtheria is known to be prevalent.

The remarks of those superintendents who, either as a matter of routine or by way of research, have carried out bacteriological examinations in the case of newly admitted patients, are given below.

Dr. E. H. R. Harries (Birmingham). "Yes, such an investigation was started by one of my assistant medical officers in the winter of 1921–22. The intention was to examine 1,000 consecutive cases. Owing to pressure of work, however, it was not possible to complete this number at the time.

"I have figures for a first series of 330 consecutive cases of scarlet fever at all ages which were swabbed (nose and throat), cultured and Schick-tested on admission. The results of this small series (for what they are worth) are as folllows :—

Negative Swab and Negative Schick ..	217 ..	65·7 per cent.
Positive Swab and Negative Schick ..	32 ..	9·6 ,, ,,
Negative Swab and Positive Schick ..	63 ..	19·9 ,, ,,
Positive Swab and Positive Schick ..	18 ..	5·4 ,, ,,

"For the purpose of comparison, I analysed 1,010 consecutive cases of scarlet fever admitted to this hospital in respect of their age-periods, and further divided the age-periods into those given by Park in his table of Schick percentages (Ministry of Health Report No. 10, page 12).

"I find that children in Park's first four groups, that is, from under three months up to 2 years, only constituted 2·6 per cent. Ninety-seven per cent. of the population in scarlet fever wards was represented by individuals from 2 to over 20 years of age ; the average percentage of susceptible individuals of these groups, as given by Park, is 33 per cent. compared with the figure of 25 per cent in the above series of 330 cases. These figures are, of course, too small to draw any reliable conclusions from."

Dr. A. D. Edwards (Bournemouth). "All scarlet fever patients swabbed (nose and throat) for diphtheria bacilli but no virulence tests carried out."

Dr. Duncan Forbes (Brighton). "Out of 6,793 scarlet fever patients admitted 3·6 per cent. harboured diphtheria bacilli. No virulence tests."

Dr. B. A. Peters (Bristol). "1913 = 8·9 per. cent. ; 1914=10·5 per cent. ; 1915=9·0 per cent. ; 1923 (8 months) = 6·0 per cent. All scarlet fever patients have swab taken from throat and nose on admission. Carriers are isolated separately. Virulence tests are made, if over 3 months carrying ; about two-thirds are virulent."

Dr. E. H. Snell (Coventry). "Yes. In 1913, 387 scarlet fever patients had their throats swabbed on admission and 24, or 6·2 per cent., were found positive. At the same time 510 patients admitted to the Coventry and Warwickshire Hospital (a general hospital) suffering from various illnesses and accidents were swabbed : 65, or 12·7 per cent., were found positive. At the same time 130 elemen-

tary school children, indiscriminately selected, were swabbed and 22, or 16·9 per cent., were positive. No virulence tests were made."

Dr. H. P. Newsholme (*Croydon*). "Seven per cent. of scarlet fever patients admitted during 1922 had diphtheria bacilli on admission. Virulence tests not carried out."

Dr. J. R. Prior (*Hornsey*). "Yes. I give the percentage for 1922-23.

1922 : cases 13 = 3·1 per cent.
1923 : cases 6 = 2·5 ,, ,,

"For reason before stated I place no reliance on these examinations I have not (as far as I recall) had the virulence test applied in these cases ; I rely on clinical evidence.

"I have had considerable experience with the virulence test with regard to diphtheria carried out at the Wellcome Research Laboratory, and I still use it.

"I am very doubtful indeed as to its value ; I am inclined to place but little reliance on it."

Dr. C. Rundle (*Fazakerley*). "In an investigation made some years ago approximately 15 per cent. of all scarlet fever patients were found on admission to have in the throat bacilli indistinguishable, morphologically and in culture, from K.L.B. A few virulence tests were made, all with negative result."

Dr. D. S. Sutherland (*Manchester*). "1922 : throat and nose= 2·6 per cent. of scarlet fever admissions. 1923 : throat and nose= ·94 per cent. of scarlet fever admissions.

"The small percentage is probably due to the fact that hitherto platinum needles have been used for obtaining cultures instead of swabs."

Dr. Harold Kerr (*Newcastle*). "On various occasions observations have been carried out on a series of 100 or 200 consecutive cases and in my experience positive swabs have each time been found in 9·5 to 10 per cent. but no virulence tests were carried out."

Dr. Dunstan Brewer (*Swindon*). "From time to time series of throats of ordinary scarlet fever are swabbed. The organism most commonly found is the small short streptococcus, usually pure. No diphtheria bacilli, or bacilli resembling the K.L.B., have ever been found by me in Swindon cases; but in a batch of cases which we received from Ramsbury, where both scarlet fever and diphtheria were epidemic, diphtheria bacilli were found.

"All scarlet fever throats which present any unusual feature, or which are more than usually severe, are swabbed ; but in Swindon I have never found a true diphtheria bacillus in any of them. My rule as regards virulence testing is that any case in which an organism indistinguishable from the K.L.B. is present in the throat for longer than a week, or in the nose for longer than a fortnight, is to be tested for virulence ; but so far, in Swindon, I have not found any cases, not even a convalescing diphtheria, in which it was necessary to apply this rule."

The late Dr. W. J. J. Stewart (*Willesden*). "No, except that all cases of scarlet fever admitted with unduly severe throat symptoms are examined for diphtheria bacilli. No virulence tests have been carried out where K.L.B. have been found. Where K.L.B. are found there is no doubt but that they play a secondary part in the acute stages of the scarlet fever attack. It is during the convalescent stages of that disease that K.L.B. assert themselves, we find, and are likely to produce dangerous attacks of diphtheria."

As regards the second question, relating to bacteriological examinations of throat and nose before discharge, the great majority of reporters (25 out of 34) imply in their answers that such examinations are not carried out as a routine measure. "In

suspected cases or carriers" ; "only in cases of nasal discharge, persistent otorrhoea and tonsillitis" ; "only when a positive swab was found on admission" ; "only when judged necessary" ; are typical answers that comprise the various circumstances in which an examination is undertaken. Among other answers the following may be quoted :—

Dr. J. Wright Mason (*Hull*). "Swabs are taken from the nose or throat in cases which have exudation on the tonsils or injection or evidence of profuse nasal discharge, and in cases with a history of previous diphtheria or recent epistaxis. If the swabs are positive and there is no evidence of clinical diphtheria, the cases are isolated and considered to be 'carriers'."

The late Dr. W. J. J. Stewart (*Willesden*). "Any scarlet fever patient known to have harboured K.L.B. in his nose, ear, or throat during his stay in hospital, is not discharged till three successive swabs on three successive days have been found negative. In my experience the scarlet fever patient who has had a diphtheritic rhinitis during his attack is, of all others, the most likely to spread scarlet fever on his return home."

Dr. E. H. Harries (*Birmingham*). "In scarlet fever wards swabbing is only practised when a case of clinical diphtheria has occurred in the ward. When such a case has occurred, the noses and throats of the remaining ward population and the staff on duty are swabbed. We have a complete record as regards the Schick test of the staff; in fact at the present time every nurse in the hospital is either naturally Schick-negative, or has been, or is in process of being, immunized by T.A.T. The ward population is also Schick-tested, and by means of swabbing and the test can be rapidly divided into groups. All cases in the scarlet fever ward who have been exposed to the infection of diphtheria are swabbed twice (nose and throat) before discharge ; two consecutive negative swabs are obtained before the patient is allowed to go.

"Virulence tests of organisms isolated are obtained wherever indicated, especially in the Schick-negative carrier of morphological diphtheria bacilli."

In five instances the present practice is to make no final bacteriological examinations for diphtheria bacilli ; the reasons given by one superintendent are as follows :—

Dr. J. R. Prior (*Hornsey*). "My practice has greatly changed during the past twenty years. In earlier years I never made a systematic search for diphtheria bacilli. Some eighteen years ago I 'swabbed' systematically all cases of scarlet fever, throat and nose ; this continued for some two years. I found it to be absolutely useless for the purpose of preventing diphtheria and gave it up entirely.

"Some three or four years ago I was much perturbed by the occurrence of diphtheria amongst scarlet fever patients, and at the instigation of a colleague, I again took to systematic swabbing of throat and nose, and I can say most definitely that it is not only absolutely useless in preventing outbreaks of diphtheria but positively misleading unless interpreted with clinical symptoms. As a matter of fact I still continue to take cultures from the throat, not with the idea of discovering so-called carriers, but to eliminate the possibility of concurrent diphtheria ; but if bipolar organisms are found I pay very little regard to it, apart from clinical evidence ; and in my somewhat extensive experience diphtheria running concurrently with early scarlet fever is very rare, although common in the convalescent stage."

Routine examinations are the rule in *Derby*, thus :—

> "One throat swab taken 48 hours prior to discharge, provided that there have been no patients in the ward showing positive swabs during patient's stay. If there have been positive swabs in the ward during patient's stay, three successive negative throat and nose swabs are required."

(3) Various Methods of Isolation. (*Hosp. forms : first issue, Sect. B, Q.* 4 *; second issue, Sect. B, Q.* 3.)—The various methods at present in use, or about to be adopted, in the several hospitals, are grouped below under headings which are commonly used to denote certain well-known systems. There is here and there some confusion about the exact significance of these headings, but it is hoped that (as a result of further inquiries) the various hospitals are correctly credited with the system or systems, as shown and defined (in small print) below.

The great majority of hospitals find a place in group (*a*), but only those are enumerated in which the superintendent concerned draws attention to some special feature or personal opinion.

Under the other groups are listed those hospitals, and often those circumstances, in which various forms of isolation are practised ; but the inclusion of a hospital within a certain group does not necessarily mean that in this hospital no other form of isolation is practised.

(*a*) *Ward Isolation.*—That is, the common method of reserving one or more wards—which may constitute a block or a pavilion—for the exclusive treatment of scarlet fever patients. Attached to such wards are usually smaller wards for the segregation or observation of special cases, and occasionally an admission ward containing two or three beds.

Birmingham.—Definite cases of scarlet fever nursed in wards of ordinary type. Septic cases barrier-nursed within these wards.

Blackburn.—Scarlet fever pavilion contains an admission ward with two beds ; two side-wards, each for one or two patients, and two large wards.

Brighton.—A "mixed case" or "query case" is side-warded.

Burnley.—Complicated cases in side-wards where a formalin lamp is kept burning.

Guildford.—Small (6 beds) wards and large convalescent wards.

Leeds.—Eighteen 14-bed wards, each having 2 private or separation rooms for one patient. In addition there are 36 beds in separate rooms for cases requiring observation and for mixed cases.

City Hospital N., Liverpool.—Small wards of 2 or 4 beds.

City Hospital S., Liverpool.—Small wards with separate entrances.

Newcastle.—Two ward pavilions.

Nottingham.—Open wards.

Southampton.—Cases in the acute stage are kept in the "acute" ward and throats examined to prevent cross-infection. After the acute stage they are removed to a general ward ; recent cases being kept apart from convalescent cases. Cases with aural or nasal discharge or other complications are isolated in a separate ward. At the end of the third week of the disease, if free from complications, patients are transferred from the general ward to another pavilion which has been thoroughly disinfected and to which no cases are admitted except through the out-bathing station.

West Ham (Plaistow).—Three pavilions of two storeys each; each pavilion comprises 6 wards, averaging 14 beds.

(*b*) *Special Wards.*—That is, the use of one or more wards for the segregation and treatment of special types, or complications, of scarlet fever.

Birmingham.—Those patients developing otitis are moved to special ear-wards and barrier-nursed.

Bournemouth.—"Rather a large number of small wards so that patients may be classified."

Bradford.—Small wards (2-4 beds) attached to the pavilions and used for septic and mixed cases; some such small wards are also used for adults.

Croydon.—One ward consists of a number of completely separate cubicles for the isolation of different types of the disease.

Hull.—Cases are isolated under the headings "acute severe", "acute mild," "convalescent," "cases with otitis or nasal discharge."

Newcastle.—Separate pavilions for septic cases.

Nottingham.—Small special wards for exceptionally severe or complicated cases.

Rochdale.—Small side-wards for barrier treatment of septic cases.

Southampton.—Special wards for acute cases and also for patients with aural or nasal discharge.

(*c*) *Cubicle System.*

Birkenhead.—An eight-bed cubicle pavilion is about to be added.

Birmingham.—Two cubicle wards, each to contain 12 beds, are practically completed at Little Bromwich Hospital.

Bromley.—One isolation block with 12 cubicles.

Croydon.—One ward consists of completely separate cubicles.

East Ham.—Cubicle system.

Leeds.—Thirty-six separation wards.

Norwich.—Doubtful cases and mixed infections nursed in cubicle block.

Portsmouth.—"Septic cases in cubicle block."

Thanet.—"All scarlet fever cases are placed in cubicles on arrival and kept there till nose and throat swabs are negative as regards K.L.B."

(*d*) *Barrier or Aseptic System.*—That is the treatment of certain patients, *in a ward containtng only scarlet fever cases*, on aseptic principles, and with the help of a tangible or imaginary barrier surrounding such patients.

Birmingham. (At both Little Bromwich and Lodge Road Hospitals).—Septic cases barrier-nursed within wards of ordinary type. Cases of otitis are also barrier-nursed in special ear-wards.

East Ham.—Barrier system.

Leeds.—For septic cases.

Newcastle.—In common use when isolation accommodation is all taken up.

Rochdale.—Septic cases barrier-nursed in small side-wards.

Warrington.—Barrier system adopted in cases where there is a possibility of cross-infection.

West Ham (Plaistow).—Barrier system in main wards.

Willesden.—Barrier system rigidly enforced.

(*e*) *Bed Isolation.*—That is, a system "whereby *patients suffering from different infectious diseases* are treated in the same ward under the same nurses, measures of strict asepsis alone being

relied upon for the prevention of cross-infections." (Dr. Rundle's definition.)

BIRMINGHAM*.—Doubtful cases and definite cases with secondary conditions, such as scabies or surgical complications other than otitis, are treated in a bed-isolation ward of 24 beds. "Large numbers of cases of true combined scarlet fever and clinical diphtheria have been nursed in the bed-isolation ward."

BRISTOL.—"The principles adopted at the Bristol City Hospital, Ham Green, are based on the 'barrier' system, but it is applied to *every* patient in its acute wards." All patients are kept in bed for a fortnight after admission; those who during this time

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* Further note by Dr. Harries:

"A bed-isolation ward was instituted at Little Bromwich in June, 1920. The system has been continuously in use since that date. Up to the present some 2,300 cases have been treated in bed-isolation. Of this total 467 were definite cases of scarlet fever on admission, in various stages of the disease, and with or without some secondary infection or complication. In addition, 453 patients were admitted to the ward as suspected scarlet fever. These latter had, on admission, either no signs or only indefinite signs of the disease, and were thus admitted for observation.

During the 6½ years that bed-isolation has been practised at this hospital, the system has broken down on three occasions in the case of scarlet fever. On each occasion actual contact of one child in an infective condition with another—in breach of rules—was established. Cross-infection was in each instance limited to the "contact." Measles has cross-infected on four occasions, and chicken-pox on three occasions. Multiple infections have followed in the case of these diseases. When cross-infection has occurred in the case of measles, it has always been initiated by a child admitted in the pre-exanthem (Koplik's spots) stage, and when chickenpox has cross-infected, the initiating case has been admitted to the ward in the incubation period. I have altogether had about 9 years' experience of bed-isolation work, and have, in this time, been able to form fairly definite conclusions as to the value and limitations of the system. Successful bed-isolation necessitates:—

(*a*) Ample bed space—12 feet of wall space per bed as a minimum. Relaxation of this standard to allow of the admission of more patients to the ward spells disaster, chiefly through the overworking of the staff, who then tend to scamp the technique.

(*b*) The best of the available nursing staff, headed by a surgically trained Sister.

(*c*) Careful and unremitting watch over convalescents; this is the weakest link in the system.

(*d*) Exclusion from the ward of certain diseases in certain phases, notably measles in the pre-exanthem stage, and chickenpox in the latter part of the incubation period. Measles in the stage of well-developed exanthem; varicella in the stage of full eruption, can be safely nursed. Whooping cough admitted in its early phase has "crossed" on one occasion.

Scarlet fever and diphtheria can be nursed in bed-isolation with a very high degree of safety, provided (*a*), (*b*) and (*c*) are adhered to.

As regards scarlet fever, bed-isolation experience confirms the view that the disease is one of low infectivity, and is spread by personal contact. The system of bed-isolation is not suitable for the small hospital; it cannot draw upon a sufficiently large or well trained staff. Fortunately, however, the difficulties of the small hospital in the matter of isolation of the doubtful case of scarlet fever, and the difficulties of fever hospitals generally in dealing with outbreaks of this disease in non-scarlet fever wards, may be greatly minimised by the use of the "Dick" test and scarlet fever antitoxin."

may have developed a secondary infection, or in whose case the diagnosis has been amended, are removed to a side-ward where they are treated with the same precautions and by the same nurses.

BURY.—"Bed: but each pavilion has a verandah and patients and beds are placed there as far as possible when weather permits. Ward windows kept open. When all the beds of a pavilion are occupied, no further patients are admitted until all the original cases are discharged—thus keeping each batch of patients by themselves. No transference of patients to a general convalescence ward."

FAZAKERLEY HOSPITAL, LIVERPOOL.*—Cases of doubtful diagnosis, cases stated to have been exposed to a secondary infection

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* According to a card of printed instructions, submitted with his questionnaire report by Dr. Rundle, the bed-isolation ritual observed in the Fazakerley Hospital is as follows:—

PRECAUTIONS TO BE OBSERVED.

"Coats to be worn for *every* purpose, and hands washed (using nail brush) after their removal.

Feeding and drinking utensils to be rinsed and placed, immediately after use, into the kitchen steriliser. They must not be laid down in the sinks in the kitchen or elsewhere. Coats must not be worn in the kitchen, but the nurse should return to the bedside bowl for washing purposes after taking out the feeding utensils,

In wards, other than "G" and "C," bed-isolation crockery must be distinctive, or separately marked.

Separate and marked sanitary utensils, lavatory cloths, bath blankets.

Coat must be worn when removing clothing, bedding, sanitary utensils, etc., to the lavatories; the coat to be subsequently removed at the bedside and hands disinfected.

Separate washing bowl, towel, nail brush, and thermometer to be used in cases of Chickenpox, Measles, Enteric Fever, and in any case where the treatment is likely to be frequent or prolonged.

Patients not to be allowed to mix with other patients, sit at common table, or use lavatories.

Bedside bowls to be immediately emptied and refilled after use. For this purpose the nurse must *not* wear coat to lavatory. The coat must be removed and hands washed, using nail brush, *before* refilling bowl.

All temperatures to be taken in axilla, and thermometer washed in lysol after use.

No toys, books, or papers to be allowed.

The doctor will decide which patients are to undergo bed-isolation, but all patients admitted to the Bed-Isolation Wards are to be so dealt with from the moment of admission until the doctor has visited the wards and given his instructions in the case. The only exception to this rule is Erysipelas, which is to be treated with ordinary cleanliness only. No nurse engaged in the active treatment of Puerperal Fever is to attend, in any way, upon a case of Erysipelas or Scarlet Fever. Rubber gloves reserved for the purpose) must be used in vaginal douching.

PRECAUTIONS TO BE TAKEN WHEN PATIENT DIES OR IS DISCHARGED.

Bedding, personal clothing, towels, bath blankets, coats, etc., to be at once placed in bundle and labelled for disinfector.

Patient's soap, flannel and tooth brush to be destroyed.

Brush and comb to be washed in lysol.

Bed macintoshes, bedside locker, bedstead, temperature chart-holder and bedboard to be washed with soap and water.

PRECAUTIONS TO BE OBSERVED WHEN COATS ARE OMITTED FROM A CASE.

These must vary according to the nature of the case, and the nurse must take the instructions of the doctor."

and diseases of low infectivity such as erysipelas, typhoid fever, mumps and whooping cough, are treated in bed-isolation wards. Patients in whom the disease is considered to be non-infectious, such as tonsillitis, enteritis, erythema, are dealt with similarly.

MONSALL HOSPITAL, MANCHESTER.—"A bed-isolation ward has not yet been adopted but will be soon."

SWINDON.—"We have found bed-isolation practicable in the open-air though not practicable in wards."

WEST HAM (PLAISTOW).—Bed-isolation ward in use.

(*f*) *Open-air Treatment.*—That is, the exposure of patients to outside air either by means of verandahs, balconies, shelters, etc., or by means of open windows in the wards.

BIRMINGHAM.—"The lower wards of the two new blocks in course of construction at Little Bromwich Hospital are provided on their southern elevation with verandahs. Very wide glass doors admit to these verandahs from the ward. The beds selected for use in these wards have wheels by which they may be readily moved."

BRISTOL.—"The treatment of all patients while in bed in an atmosphere approximating as far as possible to that of the outside air is followed by most satisfactory results, even in mid-winter, when the temperature is very little above that of the outside air."

BURY.—See under "Bed-isolation."

COVENTRY.—"As much open-air as is possible in existing buildings."

DERBY.—"Open-air under verandahs as much as possible."

HORNSEY.—Treatment in the open-air is adopted as far as possible.

LEEDS.—Open-air in summer time in corridors when feasible.

MANCHESTER.—"Emphasis should be laid upon the advantages of open verandahs running along the wards for open-air treatment of serious cases under suitable climatic conditions."

NEWCASTLE.—Now adding deep verandahs to all wards to ensure open-air treatment.

NOTTINGHAM.—Open wards and verandahs for ordinary cases.

RHONDDA.—When weather is favourable, by open-air isolation on verandahs.

ROCHDALE.—"Open-air."

SWINDON.—For severe cases and patients with complications.

WEST HAM (PLAISTOW).—One open-air shelter for 4 cases.

From a consideration of the above groups it will be seen that barrier-nursing has more adherents than any one of the other systems. This aseptic method of isolating and treating patients in scarlet fever wards is at present being carried out more or less completely in 14 or 15 hospitals. The principle of barrier-nursing is carried to its logical conclusion in those hospitals where "*bed isolation*" is practised: that is where not only all types of scarlet fever cases but all patients who may be incubating, or (in some instances) are actually suffering from, certain other infectious diseases are treated in the same ward. There are six hospitals in which apparently "bed-isolation" is carried out to some extent, while arrangements for this method are being made in a seventh. At the Fazakerley Hospital, Liverpool, and the Ham Green Hospital, Bristol, special stress is laid on the bed-isolation method. Dr. Rundle emphasises the need for bed-isolation wards in which doubtful cases may be treated, and states that one such ward, of

30 beds, dealt with 754 mixed cases during the period April 1st, 1920, to March 31st, 1923.

Some statistics relating to cross-infections and complications are given below in Table 15.

TABLE 15.

Fazakerley Hospital: Statistics of CROSS-INFECTIONS AND COMPLICATIONS.

(1) Year.	1919	1920	1921	1922	1923
(2) Number of patients admitted as cases of scarlet fever	494	1,285	1,041	812	414
(3) Percentage of total admissions ..	49	54	40·5	29·5	—
(4) Total number of cross-infections, excluding (5)	10	35	22	22	18
(5) Total number of patients incubating a secondary infectious disease at time of admission..	2	14	11	7	0
(6) Total number of patients who contracted scarlet fever after admission	0	1	2	2	2
(7) Percentage number of cases with severe complications	18	14	16	23	18
(8) Percentage number of "infecting cases"	—	1·1	1·5	2·4	—

At Ham Green, Bristol, the principle of bed-isolating has in some respects a wider application, because every patient in all the "acute wards" is barrier-nursed, while at Fazakerley undoubted cases of scarlet fever are apparently treated on ordinary lines. Bed-isolation was introduced at Ham Green by Dr. Peters in 1911, and he refers to the subjoined table in proof of the fact that the incidence of secondary infections began to fall as the result of the new method, combined with fresh-air treatment.

TABLE 16.

Ham Green Hospital: Number of cases of disease introduced into wards not intended for their reception, and the number of SECONDARY CASES *arising from them.*

Year.	1910		1911		1912		1913	
Total admissions	1,036		897		867		1,007	
	P.	S.	P.	S.	P.	S.	P.	S.
Scarlet Fever	5	—	12	4	—	—	4	2
Diphtheria	18	2	3	—	54	—	35	—
Chickenpox	9	14	2	13	5	4	13	2
Measles	1	6	5	—	6	2	—	—
Rubella	—	—	5	6	1	—	3	—
Whooping Cough	4	—	1	—	10	—	3	—
Mumps	—	—	—	—	1	—	1	—
Totals	37	22	28	23	77	6	59	4
Secondary attack-rate. (Per cent. of admissions)	2·2		2·7		0·9		0·4	

P.—Primary cases. S.—Secondary cases.

Further statistics bearing on the same matter are given in Table 17 below.

TABLE 17.

Ham Green Hospital: Statistics of CROSS-INFECTIONS AND COMPLICATIONS.

No. of patients admitted as cases of scarlet fever.	Percentage of total admissions.	Total number of "cross-infections."	Total "cross-infections" rate per cent. on admissions.	Number of patients who contracted scarlet fever after admission.	Percentage number of cases with severe complications, e.g., nephritis, arthritis, otitis, etc.	Percentage number of "infecting cases" i.e., discharged convalescents suspected of giving rise to "return cases."
374	52	8	1·1	2		1·4
476	58	22	2·7	0		2·0
439	54	11	1·4	0		1·6
370	42	17	2·0	1		1·0
219	27	19	2·6	0		2·3
414	48	14	1·7	2		2·7
709	68	22	2·2	0		1·7
478	53	23	2·7	0	20	1·4
345	39	6	0·9	0	14	0·8
500	49	4	0·4	2	8	1·4
928	65	0	0	0	10	1·1
470	36	4	0·3	3	15	0·2
353	39	8	0·8	1	18	1·1
95	12	1	0·1	1	22	3·0
219	27	3	0·4	0	22	0·0
249	34	3	0·4	0	9	0·5
665	46	20	1·4	3	10	0·6
382	25	28	1·8	17	6	0·0
722	47	28	1·8	10	6	0·5

not available

The technique employed at Ham Green is described in the following extract from a paper written by Dr. Peters in 1914 (102) and to which he refers in his present questionnaire report :—

> "All patients are kept in bed for a fortnight after admission. During this time any secondary infection they may be incubating will have developed, and a definite diagnosis can probably be made if the case is doubtful. Each patient is provided with a separate towel, face flannel, piece of soap, comb, and throat brush, which are kept in a locker beside the bed.
>
> "All eating utensils are boiled after each meal. Other utensils are cleansed and disinfected after use. The nurses wear rubber gloves lined with canvas, when closely handling a patient, which are immersed in perchloride of mercury solution before going on to the next. The same practice is followed by the medical officer.
>
> ". . . When a secondary infection occurs in the main wards, the affected patient is treated in a side-ward opening off the main ward, with the usual precautions, and nursed by the staff as in the main wards. In no case during the past two-and-a-half years has any spread of infection to the main ward occurred through this."

Dr. MacIntyre (Plaistow), in his answer, refers also to his paper of 1922 (82), which appeared in the same issue of the *Lancet* as that of Dr. Rundle (109b). In this paper the system is fully described, and it is recorded that in three years 482 cases were treated in the bed-isolation ward with a total of eight cross-infections.

From Section C of the questionnaire paper are taken the following figures for cross-infections at Plaistow Hospital :—

TABLE 18.

Plaistow Hospital : CROSS-INFECTIONS.

Year.	No. of scarlet fever admissions.	No. of other patients developing scarlet fever in hospital.	No. of scarlet fever patients who developed diphtheria in hospital.
1920	756	5	4
1921	1,098	7	5
1922	592	3	4
1923	412	0	2

The bed-isolation method credited to Swindon differs from that as practised elsewhere, since it is intimately associated with the open-air treatment. Dr. Brewer writes : "Experience has satisfied me completely that the passing of a nurse through the open-air in going from, what may be considered, an infectious case to a ward containing only mild uncomplicated cases, is sufficient to ensure that she does not carry infection from one to another."

On the other hand the mention of bed-isolation as a special

system of isolation prompts a note of disapproval in two instances. Thus :—

(*a*) *Dr. J. R. Prior.*—"Bed and barrier system has never been systematically adopted. I know from inquiries the very great strain upon the staff and I look upon it as an interesting experiment, but not a method that can be usefully adopted for general purposes. I have come to this conclusion after definite inquiry."

(*b*) *The late Dr. W. J. J. Stewart.*—"Of bed-isolation I do not approve. No guarantee can be given that it is safe. In every instance tried it has broken down and cross-infection has taken place. It is, therefore, not a justifiable method of treatment. Besides, it is not practicable in the case of adults who would not submit to it."

Dr. Brewer also mentions bed-isolation in a ward as a method which he tried but rejected at Swindon because "it is totally impracticable with a staff of such numbers and experience as we can command."

The Barrier System, as concerned with the barrier-nursing in a ward containing only scarlet fever cases, is carried out in varying degrees at eight hospitals. In four of these it is used for septic cases or where there is a special danger of cross-infection ; at Newcastle it is commonly adopted when all isolation accommodation is engaged.

At the fever hospitals of East Ham, West Ham and Willesden barrier-nursing in the main wards is the general rule at the present time.

"At Willesden," Dr. Stewart writes, "the introduction of the barrier system or aseptic methods of treatment, carried out in the most rigid form, has effected a remarkable reduction in secondary complications and cross-infection in this hospital. The method was first introduced in 1910, but since 1919 has been more rigidly enforced."

Dr. Harries (Birmingham) also writes enthusiastically. He says : "Barrier-nursing is carried out for every case in the ear ward, and every case of 'septic' scarlet fever is barrier-nursed in the ward to which it has been admitted. Barrier-nursing is being increasingly employed in the scarlet fever wards ; and in my opinion the aim should be to have every case admitted to a fever hospital barrier-nursed."

On the contrary, the barrier system at Fazakerley has been supplanted by bed-isolation ; at Manchester "it is reported to have been unsuccessful owing probably to insufficient floor space per bed" ; and at Coventry it was tried for a time but "without marked success."

Close behind barrier-treatment in popularity comes *open-air treatment*, adopted either as an adjunct to other methods under certain conditions, or as a fundamental policy.

Dr. Boobbyer remarks in his questionnaire form that "until about 30 years ago, a uniform temperature was considered essential, but fresh air is now held to be the one thing needful.' Dr. Peters is also a strong supporter of this method and considers that his practice of keeping fully open all the windows in the ward has helped considerably to reduce the attack

rate of complications and the case mortality rate. "Open-air isolation" is considered by Dr. Brewer as the best form of treatment for severe cases and complications and in an appendix to his questionnaire report he adds the following :—

> "The treatment was adopted mainly in the interests of the patients themselves, but it has a bearing upon some of the matters which the Committee may have under consideration. We found it possible to treat on the same verandah cases of various distinct infections. All the cases were very seriously ill, and many of them were probably highly infective, not only as regards their parent disease, but as regards their complications also. We have had measles and pneumonia ; whooping cough and pneumonia ; encephalitis lethargica, tuberculous meningitis, and diphtheria 'isolated' from each other by free air-space only. Similarly, we have had cases of scarlet fever of severe septic type and cases of scarlet fever with varying complications under treatment at the same time. In no case has cross-infection, either of the parent disease or of complication, ensued. We have found bed-isolation practicable in the open-air though not practicable in wards.
>
> "This open-air method of treating infection is productive of great saving in building costs as nothing is needed but a roof and one wall. It is, however, rather more expensive in regard to the nursing staff."

Dr. Veitch Clark in a covering letter to his questionnaire report advocates the use of open verandahs, and Dr. Harold Kerr is adding such adjuncts to all the wards of the Newcastle City Hospital.

Open-air methods do not figure among the various forms of treatment that have been previously tried and rejected. On the other hand, they appear to form a very important adjunct to other systems and especially to that of bed-isolation.

Next in order come *Special Wards*, which are reported to be in use at nine hospitals. Usually, there are small separate wards reserved for cases of sepsis and ear disease ; in other instances the scarlet fever block generally consists of comparatively small wards for the purpose of differentiating and separating patients according to the type or stage of their illness.

Dr. Harold Kerr remarks that "many years ago there was no classification of cases (in the City Hospital, Newcastle), and septic conditions were much more prevalent than to-day." In seven hospitals a *cubicle system* forms a part of the isolation system, and at Birkenhead an eight-bed cubicle pavilion is about to be added. At Portsmouth, it may be noted, septic cases are treated in the cubicle block.

As regards other methods of treatment or isolation the great majority of reporters replied that no other method had been tried. The instances in which methods other than those now in practice had been adopted and then discarded have already been partially dealt with in the summary above. It only remains to add in this connection that the Milne method (in hospital) is mentioned by three reporters, but this form of treatment is discussed elsewhere.

During the course of the enquiry Dr. Arnold visited the infectious diseases hospitals at Bristol, Newcastle-on-Tyne, Nottingham and Swindon in order to get more information about

open-air methods employed at these institutions. He found that only Dr. Boobbyer considered that open-air wards and verandahs could be counted as permanent additions to the accommodation for scarlet fever cases, but at the same time it was stated that open-air treatment was not enforced in very cold, damp weather. Dr. Peters could by no means count on open-air verandahs, etc., as reliable and permanent additions to the ordinary accommodation of a hospital, because out-door methods were often unsuitable at just that time of year when scarlet fever was prevalent. . . . All the medical officers concerned agreed that, when it was possible, open-air treatment was suitable for patients with complications and, indeed, specially beneficial in septic cases. All except Dr. Potts of Newcastle considered also that cases of nephritis could be treated in the open-air. The only contra-indication in Dr. Peter's practice was infancy, and he did not think that babies under 12 months could be left in the air day and night by reason of their susceptibility to changes of temperature. In no hospital did it appear that the nurses engaged in open-air work were provided with special uniforms, it being assumed that they would make such additions to their clothing as they thought necessary. Objections from the staff are apparently rare and in Nottingham Dr. Boobbyer said open-air service was popular. In most of the hospitals open-air methods are used only in the case of bed patients, but at Nottingham convalescents slept on verandahs where space was available.

The constructional arrangements for open-air treatment in certain of the places visited are described by Dr. Arnold as follows :—

> *Bristol.*—The verandahs are on the west side of pavilions which run north and south ; they are entered from the wards. They are 12 ft. in depth with a glass roof over the whole depth. The roof meets the ward wall below the level of the hopper part of the window which thus opens direct from the ward to the open-air. Dr. Peters finds that verandahs of this width give protection against driving rain, although it is sometimes necessary to turn the beds lengthwise near to the wall. He believes that a verandah of this type protects the beds against all weather except snow. Some of the pavilions are two-storied ; it was mentioned that snow from the roof of these had in falling damaged the roof of the verandah and special guards had, therefore, been provided at the roof-gutters.
>
> With regard to the "open window wards," these are used for most cases of scarlatina during the first fortnight in hospital. Throughout this period all patients are in bed and a fairly strict bed-isolation routine is carried out. The main object is to prevent cross-infections from septic cases, from cases wrongly diagnosed and from intercurrent infections, some of which may be incubating at the time of admission. Whilst the open-air treatment is considered beneficial to the individual patient its object is largely to diminish the risk of cross-infection. Under these conditions Dr. Peters considers that 1,500 cub. ft. per patient is generally sufficient. The ordinary heating of the wards is continued as it keeps the air drier. The air temperature at times falls below freezing point.
>
> The windows are sash windows with hoppers above. The hopper portions are usually kept closed, and the sash windows fully open on each side of the wards.

Newcastle.—Verandahs are being added from time to time to the west side of pavilions which run nearly north and south. They are entered direct from the wards. The one shown to me as typical of what it was intended to build in future, was about 18 ft. in depth, but the glass roof extended only 12 ft. from the wall. The relative position of the verandah roof and the ward windows was as at Bristol. There are also long verandahs attached to some huts of temporary construction, but these are of a type not recommended by the medical officer.

Nottingham.—There is a pavilion which I understand was built specially in 1916 for open-air treatment of scarlatina, but it is at present being used for tuberculosis. The pavilion runs approximately *north and south*, and consists of verandahs facing nearly east and west, and backed by a central dividing wall. The verandahs are 18 ft. deep, and are roofed for the whole depth; the outer 8 ft. of the roof is of glass, and in this there are some ventilators. Centrally there is a dining room and kitchen. Cloak rooms are added to the usual sanitary annexe at each end of the pavilion. Each verandah is divided by dwarf partitions about 9 ft. long at intervals of about 16 ft., each bay being intended for 2 beds.

There are also verandahs to most of the scarlatina wards. The pavilions run, approximately, north and south. The arrangement of the verandahs differs from those seen at the other hospitals inasmuch as they are placed on each side of the wards and thus some face east and some west. Rails are provided on which tarpaulin curtains can be used to close the front of the verandah in bad weather. There are ventilating windows in the roofs of the verandahs. The hopper portions of the ward windows are above the level of the verandah roofs. Dr. Boobbyer has had a long experience of the open-air treatment of scarlatina, and is strongly in favour of it. He emphasised the improvement which it brought about in the health of the nursing staff, and especially the diminished incidence of infections in the staff.

(4) Special Methods of Treatment found helpful in Reducing the Length or the Cost of Hospital Isolation. (*Hosp. forms: first issue, Sect. B., Q.* 7.)—In the majority of reports the answer to this question was simply "No." (See, however, p. 102).

(5) Practice Regarding Standards for Bed-space. (*Hosp. forms: first issue, Sect. B., Q.* 6; *second issue, Sect. B., Q.* 5 *and* 6.)—Figures relating to the cubic space were received from very nearly all the hospitals concerned, and further information concerning floor space and the wall space between contiguous beds was received from all those hospitals to whom the second issue of questionnaires was sent. As regards cubic space the standard aimed at in twenty-two hospitals was 2,000 cub. ft. or over; in sixteen 1,500–2,000 cub. ft.; in eleven 1,000–1,500 cub. ft.; in four 500–1,000 cub. ft.; in one instance the standard was 400 cub. ft. The answer from one hospital was "No special standard; amount of space varies with the number of patients." Not uncommonly it was mentioned that the figures given were perforce reduced at epidemic times.

In the matter of floor space there was less variation in the answers; the majority of figures come within the limits 100–200 sq. ft., and 144 sq. ft. is the most frequent answer.

In Question B. 6 (second issue) the various medical superintendents were asked for any evidence that the reduction of

their respective standards had been followed by an increase in the number of complicated cases, cross-infections or "infecting cases." In 18 instances the reply as regards one or more of these considerations was a positive one, though seldom accompanied by statistical evidence; in 13 instances the replies were in the negative, while in four papers only indirect answers were given.

Taking these three classes of replies in the reverse order: the indirect replies included the following answers. "These standards have only been adopted two months ago" (Bootle). "The hospital is only full in cases of severe epidemics, so that usually patients have more than the minimum space" (Darlington). "Capacity of hospital not strained sufficiently to produce any interruption in convalescence" (Grimsby). "No relaxation necessary" (Sunderland).

The negative answers were qualified in the following instances:—

Dr. E. H. Snell (*Coventry*).—"No, but I have had a strong general impression that the continued use of a ward without occasional cleansing has increased the number of return cases."

Dr. J. J. Jervis (*Leeds*).—"Standard only once relaxed, i.e., in 1922. 'Returns' and 'cross-infections' in this year not over average."

Dr. P. Boobbyer (*Nottingham*).—"No. The open-air, or semi-open-air, conditions observed in recent years have been sufficient to counteract the injurious influence of occasional overcrowding."

As regards the positive answers, the following two quotations may be given:

Dr. E. H. R. Harries (*Birmingham*).—"When I took over this hospital as medical superintendent in 1920, the city was experiencing a very considerable epidemic of both scarlet fever and diphtheria, with consequent great pressure upon the available accommodation. I found that the standards noted under Question 5 ("cubic space 1,500 cub. ft.; floor space varies; types of ward differ; wall-space 6 ft.") had perforce been relaxed temporarily. There is no doubt that this relaxation of standards as regards cubic space, etc., led to an increase in the extraneous complications of scarlet fever such as anterior rhinitis, impetigo, onychia, secondary tonsillitis and clinical diphtheria. These complications and their spread by cross-infection in the wards were brought about very largely I think as a result, not so much of overcrowding *per se*, but by reason of the fact that the staff became overworked and could not maintain the high standard of nursing which is necessary in order to prevent the transference of secondary infections in wards receiving cases of infectious diseases. I do not mean to imply that relaxation of the standard of cubic space had any effect on the percentage incidence of true septic or toxic types of scarlet fever, or upon the percentage incidence of complications comprised in what has been termed the late secondary syndrome. The net results, however, of relaxation of the standard of cubic space was undoubted delay in clearing up these external pyococcal infections, e.g., sore anterior nares, cracked lips, onychia, etc. Limitation of cubic space undoubtedly favoured the spread of diphtheria on the appearance of this disease in a scarlet fever ward, not because the infection was air-borne to any extent, but because, under the conditions noted above, any serious attempt at barrier nursing was impossible.

Owing to a uniformly high standard as regards freedom from any discharges or sores having been insisted upon before release from hospital, I cannot say that the percentage of return cases was increased

by reason of the conditions outlined above. I am strongly of opinion, however, that unless ample air-space is allowed during convalescence that saprophytic mutual re-infections in convalescence do take place

The late Dr. W. J. J. Stewart (Willesden).—"The effect of overcrowding is seen in the epidemic years in and around 1908, 1914 and 1921: in those years, floor-space has been reduced to, approximately, 100 sq. ft., with the result that secondary complications greatly increase, especially rhinitis, which is, in my opinion, the main source of infecting cases."

It should be noticed that the majority of these affirmations refer to cross-infections and complicated cases, while only five reporters consider that the number of "infecting cases"* is increased. Dr. Stewart in support of his contention invites reference to the statistical portion of his report, and the figures relating to the epidemic years that he mentions are tabulated below.

TABLE 19.

Willesden Hospital: Percentage of COMPLICATED CASES AND INFECTING CASES.

Epidemic years.	Total no. of cases admitted.	No. of cases with severe complications.	Percentage of total admissions.	Infecting case rate.*
1908	625	362	47·0	6·9
1914	556	253	45·0	5·0
1921	882	184	20·0	8·7

Unfortunately, the number of statistical returns, complete in all particulars for a period of 10 years and over, are too few to allow of similar correlation in more than a small proportion of the hospitals under review. In the following table, however, some statistics bearing on the question are set out.

* By an "infecting case" is here meant a scarlet fever convalescent who, within 28 days of his return home from hospital, is presumed to have infected one or more inmates (return cases) of his home.

TABLE 20.

Gives the rates of CROSS-INFECTIONS, COMPLICATIONS *and* INFECTING CASES *at certain hospitals during the years of highest admissions.*

Hospital.	Year or years of maximum admission (except in two cases).	Total no. of admissions.	Percentage of cross-infections.	Percentage of complicated cases.	Percentage of infecting cases.
Bedford ..	1906	168	—	—	10·0 (H) in following year
	1913	245	—	—	6·9 „ „
Blackburn ..	1905	1107	—	—	4·0
	1909	760	—	—	7·0 (H)
Bradford ..	1922	924	Ten scarlet fever patients contracted diphtheria.	22·6 (H)	0·21 (L)
Brighton ..	1913	615	—	—	5·0 (H)
Bristol ..	1910	709	2·2 (a.a.)		1·7
	1914	928	0·0 (L)		1·1
	1922	722	1·8 (a.a.)		0·5
	1917	95 (L)	—	—	3·0 (H)
Derby ..	1915	440	—	—	3·0 (H_2)
Devizes ..	1915	160	—	40·0	4·0
	1919	115	—	19·0 (H)	—
	1922	116	—	24·0	6·0 (H)
Doncaster ..	1914	222	—	11·5 (a.a.)	2·1 (b.a.)
	1915	168	—	6·2 (b.a.)	6·2 (H)
Liverpool City Hosp. North	1907	470(L)	—	32·1	—
Monsall ..	1921	3173	—	—	4·06 (a.a.)
Newcastle ..	1914	1404	—	—	5·6 (H)
Norwich ..	1911	593	—	21·4 (H) in 1912	—
Portsmouth ..	1922	1010	—	2·3 (L)	—
Southampton	1923	322	—	—	3·4 (H)

NOTE.—H = the highest figure recorded; H_2 = second highest figure recorded; L = the lowest figure recorded; a.a. = above the average; b.a. = below the average.

As will be seen, the statistical information regarding "complicated cases" and cross-infections is scanty and by no means conclusive. Thus, in Bradford, Devizes, and Norwich the highest recorded figures for complicated cases are found in these years when the admission figures were higher than at any other time; but at Portsmouth in 1922, when the maximum number of admissions was recorded, the complicated case rate was lower than in any other year. Stranger, perhaps, is the case of the City Hospital North at Liverpool, where the lowest admission figure corresponds with the highest complicated case figure—and both are unusually extreme.

At Bristol (Ham Green) the highest number of admissions during the last 20 years occurred in 1914, when the figures were 928; in this year there were no cross-infections. In 1922, however, there were 722 admissions with 28 cross-infections, giving a rate of 1·8.

As regards the "infecting-case" rate there is evidence from the figures above that it bears some direct relationship to overcrowding, or at any rate to an admission rate above the average. In 12 out of the 14 hospitals listed in Table 20 the year marked by the greatest number of admissions, or in a few cases the succeeding year, is also marked by a high infecting-case-rate that is either above the average or more frequently is the highest figure recorded in any year. But, again, there are exceptions and one such is seen in the case of Bradford.

Some figures relating to the Ladywell Hospital at Salford, which were kindly supplied by the late Dr. J. W. K. Mullen, also show that if a high admission-rate is usually accompanied by a high infective case-rate, a low admission-rate is not necessarily synchronous with a low infecting-case-rate; witness the figures for 1918 in the table below.*

TABLE 21.

Ladywell Hospital, Salford: INFECTING-CASE-RATE.

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
No. of cases admitted.	996	1973	825	348	150	232	517	898	1422	1094
No. of cases discharged.	859	1984	882	374	138	244	446	912	1347	1055
Infecting case rate.	7·3	5·2	4·1	3·7	0·66	6·9	3·1	4·0	3·8	6·5

(6) LENGTH OF STAY IN HOSPITAL.† (*Hosp. forms: first issue, Sect. B., Qs.* 7, 9 *and* 10; *second issue, Sect. B., Qs.* 7 (*a and e*) *and* 10; *Sect. C., Col.* 6.)—The ninth question of Section B. in the first issue of hospital forms sought information about the procedure adopted and the conditions laid down before a scarlet fever patient is discharged from hospital. Eleven answers included among the conditions the minimum number of days usually fulfilled in hospital before a scarlet fever patient is discharged.

In the second issue of hospital questionnaires definite information was asked (in Question 7*a*) concerning the "minimum

* Dr. Foord Caiger has recently expressed to us his views on overcrowding as follows:—"That overcrowding in hospital wards may indirectly influence the occurrence of return cases by furthering the development of septic affections of the throat, nose and ears, I can well believe; and to these (affections), as the result of past experience of the periodical autumnal overcrowding which used to be the rule in the public fever hospital, I would add nephritis and diphtheria."

† See also Dr. Greenwood's statistical study of this question on page 226

length of stay in hospital of uncomplicated cases," and this was received in every case. Information from 46 hospitals is thus available and is set out in the table below.

TABLE 22.

Length of Stay in Hospital.

Minimum period of detention in hospital.	Number of hospitals at which such period is observed.
42 days	15 hospitals.
40 ,, ...	1 ,,
35–42 ,, ...	3 ,,
35 ,, ...	6 ,,
30 ,, ...	1 ,,
28 ,, ...	18 ,,
21 ,, ...	2 ,,

In the great majority of answers to the question in the second issue of questionnaires figures are given without comment, but in a few instances they are qualified by such statements as "approximately," "desquamation being practically complete," etc.; two superintendents state that there is no fixed minimum. At one or two hospitals the limit varies according to the age of the patient and is higher in the case of children than in that of adults; at Bradford the minimum is reduced where the child has no brothers or sisters at home. It is assumed that the period is reckoned from the date of admission except in the four instances where the onset of illness is taken as the starting point of the period.

In most of the hospitals, the average period of detention figures for 1923 (as shown in the statistical returns, Section C) exceed considerably the prescribed minima which are given in answer to Question 7*a*. In the hospitals shown in the following table, however, this disparity is much less marked, and in the case of three hospitals the figures for 1923 show that, on the average, scarlet fever patients were discharged within the prescribed periods of minimum detention.

TABLE 23.

Hospitals in which the AVERAGE ACTUAL PERIOD OF DETENTION *of Scarlet Fever patients in* 1923 *approximated to the prescribed minimum periods.*

Hospital.	Prescribed minimum period.	Actual average period in 1923.
Bradford	40 days	37·2 days
Darlington	42 ,,	43·0 ,,
Derby	35 ,,	37·0 ,,
Grimsby	35 ,,	38·0 ,,
Hornsey	34 ,,	35·6 ,,
Leeds	42 ,,	43·7 ,,
Nottingham	42 ,,	44·0 ,,
Oldham	35 ,,	33·0 ,,
St. Helens	28 ,,	35·5 ,,
Sunderland	28 ,,	33·0 ,,
Thanet	42 ,,	47·0 ,,
Wigan	40 ,,	38·0 ,,
Workington	35–42 ,,	35·8 ,,

In order to show the tendency of the figures which (in Column 6 of the statistical sections) give the average number of days for which scarlet fever patients were retained, graphs have been made in the case of those hospitals where records extend back for 10 years or more. In these graphs (Nos. 1 to 27), which are shown at the end of the report, the behaviour of the various curves is somewhat as follows :—

First may be noted those hospitals where curves are, generally speaking, above the " 50 day line " : at Cardiff on one occasion only since 1904 has the average duration been less than 50 days ; the curves for Manchester and Hull keep above the line until 1921 ; that for Nottingham until 1920 ; that for Leeds until 1917 ; and that for Rochester until 1917 ; the Plaistow curve is also mostly above the 50 line and in 1923 nearly approached the 60 line. The curves for Darlington and Bournemouth are unusually irregular and cross the 50 line repeatedly ; those for Warrington and for Rochester (since 1916) keep near the line, year by year.

The majority of the curves, however, fall below the 50 line, and in the following hospitals the average periods of detention vary between 50 and 40 days :—Bedford, Blackburn, Doncaster, Liverpool (the curve seldom leaves the 40 line for any distance), Norwich, Plymouth, Rochdale, Willesden and Workington.

The Derby curve has been crossing and recrossing the 40 line since 1914 ; those for Blackburn and Willesden have frequently come below it in recent years, and since 1914 the curves for Shrewsbury and Southampton have remained almost consistently below the line. The Bristol curve, with one year excepted, has remained below the 40 line since 1913 ; the Newcastle curve reached the 40 line in 1919 and has since been descending still lower ; the lowest mark of all, however, has been reached by the Wallasey curve, which in 1921 touched the 30 line.

In the case of Bristol, Hull, Newcastle, Wallasey and also in Leeds and Rhondda, the graphs show that there has been in these hospitals, during the last fifteen years or so, a more or less progressive shortening in the period of hospital isolation.

If, now, the " 40 line " is taken as the rubicon, and research is limited to the returns for the years 1921–2–3, we can distinguish those hospitals where the period of detention for scarlet fever patients, at the present time, is well below the average. A list of those hospitals is given in the following table.

TABLE 24.

List of hospitals where the AVERAGE LENGTH OF ISOLATION *in the case of Scarlet Fever patients has during the years* 1921–2–3 *fallen on one or more occasions below* 40 *days.*

	1921		1922		1923	
	Cases	Average stay.	Cases	Average stay	Cases	Average stay
Birkenhead	251	36	248	38	310	37
Bournemouth ..	171	47	186	34	128	47
Bradford	727	43	924	42	588	37
Bristol	382	35	722	36	592	40
Derby	421	37	331	45	277	37
Grimsby	No	records.	76	38	100	38
Hornsey	571	35	397	35	217	35
Newcastle	1115	31	560	32	No	records.
Norwich	112	41	546	32	,,	,,
St. Helens	255	43	224	36	277	33
Southampton ..	171	32	248	33	322	36
Wallasey	190	30	94	30	61	37
Workington ..	45	42	58	43	53	35

The medical superintendent of each hospital in Table 24 was subsequently asked if he had deliberately aimed at a reduction in the period of hospital isolation; and, if so, to mention the measures that he considered had contributed to his results. The following are the replies that were received:—

Dr. D. M. Mathieson (*Birkenhead*). "We have endeavoured to keep the period of hospital isolation of scarlet fever patients to 30 days in the case of "clean" cases. In all probability the disease ceases to be infectious much earlier than is generally allowed. We have used no special methods to which we attribute success. Of course, all cases in which there are discharges or other complications are kept in hospital until these conditions are cleared up."

Dr. A. D. Edwards (*Bournemouth*). "No deliberate reduction of scarlet fever isolation aimed at; in fact some cases are retained so that the child may have the prolonged advantage of good food and environment. Concerning the factors that would prolong the period in hospital

"(*a*) I would suggest that the Bournemouth cases have a somewhat lower proportion of unhealthy noses than the average, this being due to a relatively good environment. Also, all cases of nasal discharge or soreness are treated throughout with mild lotions and disinfectant ointment. Nose and throat swabs are taken from each case admitted and special attention is given to nasal discharge or sores giving positive results for the Klebs Loeffler bacillus.

(*b*) Peeling and complications and severity of disease: the type of illness is very mild, but I keep most of the cases in bed for three weeks and think that this may hasten peeling on the feet and also obviate complications. The patients are not weighed on admission or on discharge, but it is my opinion that in about 60 per cent. of cases the child leaves hospital in better condition than it was before it contracted scarlet fever."

Dr. J. T. Kitchin (*Bradford*). "No. Care is exercised on the individual cases. 'Only' children and adults—the latter of whom appear to be less infective than ordinary cases in children—have often been sent home at the end of about 5 weeks from the onset of the illness. Septic cases are isolated from the non-septic. Occasionally, when there are other children at home, children are sent out under six weeks from the onset if they can be taken in by grand-parents or childless relatives."

Dr. B. A. Peters (*Bristol*). "My shortened period is due to reducing minimum period of detention to one month instead of 6 weeks; ignoring desquamation; avoidance of septic complications, such as rhinitis, by aseptic nursing; milder type of disease. I attribute our increased period for 1923 to a slight increase in virulence—causing more severe cases, more deaths, and more numerous complications delaying discharge."

Dr. A. E. Brindley (*Derby*). "The procedure usually adopted is to discharge patients at the end of five weeks or thereabouts, if there are no complications, and the mucous membranes are normal so far as can be ascertained. We disregard the peeling of the feet, although as a matter of form we paint the soles of the feet with iodine before discharge if there is any desquamation left. Our great aim is to prevent complications such as rhinorrhœa, otorrhœa, nephritis, by the prevention of overcrowding, and the separation of cases with these complications.

As our internal accommodation is somewhat limited we utilise to the full the verandahs which we have provided in connection with all our pavilions. When such cases occur we either utilise the cubicles, or separate by screening on verandahs, or "bed-isolation." I consider that the open-air treatment (that is, beds placed on verandahs) gives the best results, for we have found that if we have to take the beds inside the wards owing to stormy weather, thereby reducing the cubic space per bed within the wards, the proportion of complications such as rhinorrhœa and otorrhœa increases."

Dr. J. R. Prior (*Hornsey*). "In answer to your inquiry whether I have aimed deliberately at a reduction in the period of detention: this is so. For some years past, I have endeavoured to reduce the period in hospital. I do not adopt any special mode of treatment, but I act on the following principles. For quite young children up to 7 years I seldom discharge before the 34th day of illness.

From 7–12 years not less than the 32nd day.
From 12–19 or 20 not less than the 30th day.
Adults (over 19 or 20) not less than the 28th day.

I think that there can be no doubt that young children are far more likely to give rise to return cases than older children and adults.

"These periods apply, of course, only to 'clean cases.' I regard desquamation of no importance, but I do not discharge patients desquamating profusely, or on the hands, (especially in children), as it is liable to cause alarm outside. I may add that the examination before discharge is very strict. They are examined two days before they go, again on the morning of discharge, and a third time by the matron immediately before they are handed over to the parents. I have no reason whatever to believe that the slightest harm has resulted from this procedure. In fact, I believe that the periods might be cut down still further with safety, but for reasons which you will readily appreciate. . . . one has to be careful."

Dr. F. Hauxwell (*St. Helens*). "Clean, uncomplicated cases are always discharged 28 days from date of admission, no matter what desquamation is. This practice commenced about 1918. When the case is admitted desquamating and it is possible to fix the day of

onset we usually discharge the case (provided it is clean and uncomplicated) 30 days from day of onset.

"Without knowing the routine in other hospitals it is rather difficult to state why the average duration of stay of our cases should be less than in the majority. There are two points, however, to which we pay special attention :—

"(*a*) All septic cases are treated with anti-streptococcic (polyvalent) serum. Acute septic throats get two injections of 10 c.c. each. Septic sores, nasal discharge, etc., during convalescence receive smaller doses.

"(*b*) Without exception, all cases are kept in bed 21 days and particular care taken to avoid albuminuria.

"These precautions, no doubt, help to prevent or shorten septic complications and albuminuria—the two conditions most likely to lead to prolonged stay in hospital."

Dr. T. W. Naylor Barlow (*Wallasey*). "I have deliberately aimed at a reduction of the period of hospital isolation." Dr. Barlow contends that it is "quite unnecessary to keep in the very mild cases for the usual six weeks"; he considers each case on its merits. The result is "that some cases have been kept in for a fortnight, while others with discharges from the ear or nose (and these are very uncommon nowadays) remain in any length of time up to three months . . . . The effect of halving, approximately, the period of detention in hospital is to double the accommodation."

Dr. R. W. Macpherson (*Workington*). "I have rather inclined to a shorter period of isolation in cases of scarlet fever where there have been no complications. The daily bath has hastened desquamation and in some cases where desquamation has not been quite complete on the feet I have discharged. My procedure has never been followed by a return case,"*

Summarising these several statements, it appears that the majority of superintendents who have achieved a reduction in the period of hospital isolation have also aimed at such a result; two reporters state that they have not aimed at any reduction, while in two instances this part of the question is not answered. The methods or principles to which reduction was attributed include the following, more or less in order of their reported frequency.

(*a*) Attention to individual patients and especially those with discharges from nose or ear; (*b*) ignoring desquamation; (*c*) hastening desquamation; (*d*) separate isolation of septic cases; (*e*) open-air methods; (*f*) aseptic nursing; (*g*) anti-streptococcic serum; (*h*) daily bath; (*i*) appointment of a consulting otologist.

In addition it is implied more than once that a reduced average length of stay in hospital is due largely to the fact that the present type of scarlet fever is mild and therefore free from the complications that so often account for prolonged hospitalisation.

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* To these quotations may be added one from a recent supplementary report by Dr. E. H. R. Harries (Birmingham):

"I am in favour of the early discharge from hospital of the uncomplicated case. I am sure that there is nothing to be gained by keeping such cases for lengthy periods in hospital. I do not believe in the infectivity of desquamation."

The returns sent in from the various hospitals helping in the enquiry showed that there is considerable diversity of practice in different districts as regards the period of stay of scarlet fever cases in hospital. It was thought desirable, therefore, to make some further enquiries in order to ascertain: (1) at what period during their stay in hospital patients most frequently develop complications; (2) what illnesses or complications attributable to scarlet fever have occurred after discharge from hospital; and (3) what were the periods of hospital detention in the case of patients who suffered from these subsequent illnesses. For these purposes the enquiry was limited to certain hospitals which (according to the evidence of previous returns) might be comparatively regarded as "long-stay hospitals" (group A) and "short-stay hospitals" (group B).

In the majority of the returns relating to complications occurring during hospital treatment there are records of 500 or more consecutive cases admitted to hospital during 1924, or during this year and one or two of those immediately preceding it. These returns are summarised in the table below and it may be noted that in the case of Bristol and Birkenhead the phases of hospital detention are reckoned according to the onset of the illness and not according to the day of admission to hospital.

TABLE 25.

Shows the number of patients who developed SCARLET FEVER COMPLICATIONS *in various hospitals, according to the time at which such complications were first noticed.*

Hospital and period under review.	No. of records examined.	No. of patients developing complications.							
		Within 3rd week after admission.		Within 4th week after admission.		Within 5th week after admission.		Within 6th week after admission.	
		No.	Percentage of total no. developing complications.	No.	Percentage of total no. developing complications.	No.	Percentage of total no. developing complications.	No.	Percentage of total no. developing complications.
Group A.									
Monsall H., Manchester, Jan.-June, 1924.	500	222	86·3	17	6·6	6	2·3	12	4·6
Fazakerley H., Liverpool, 1924.	500	60	39·7	37	24·5	22	14·5	32	21·1

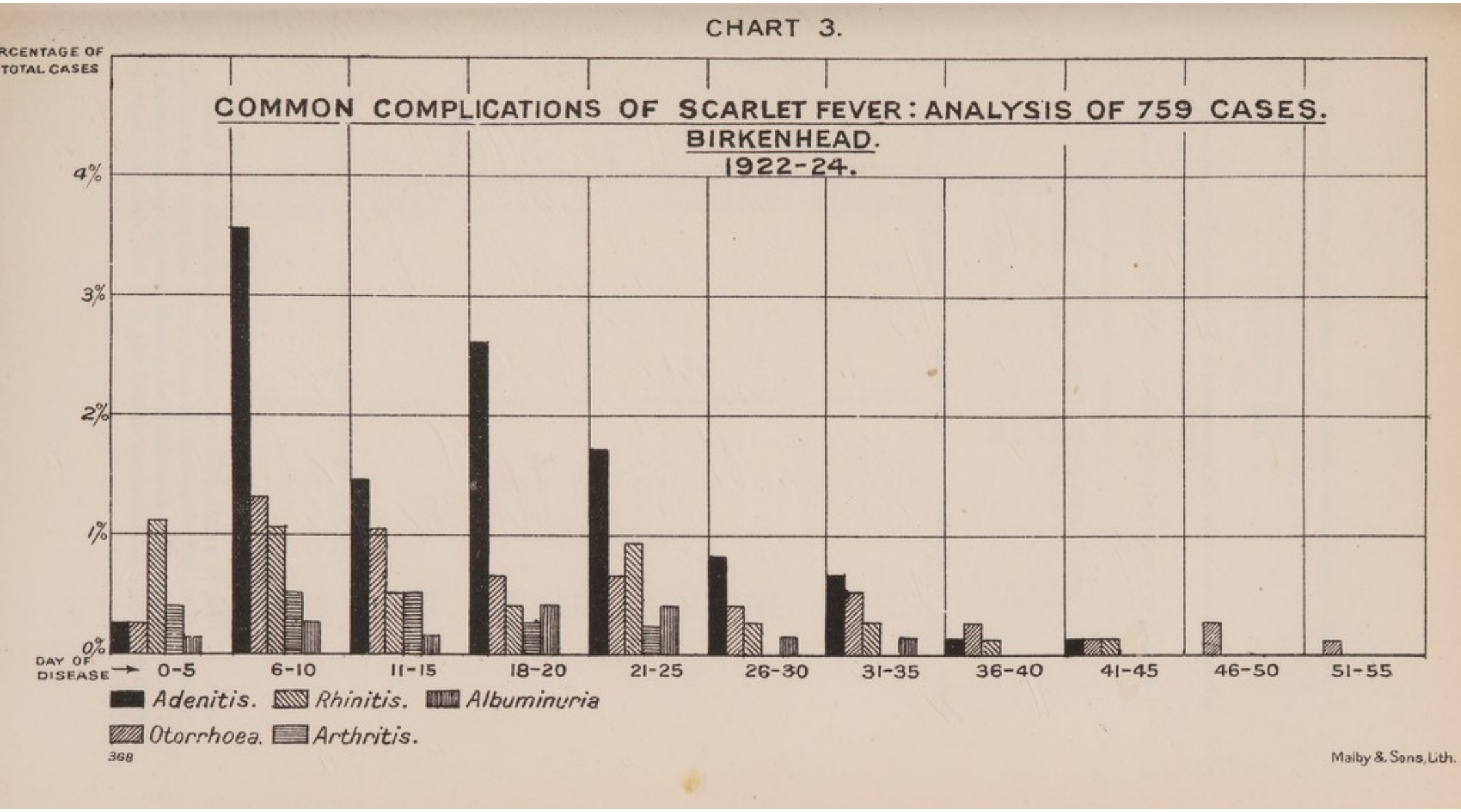
Hospital and period under review.	No. of records examined.	No. of patients developing complications.							
		Within 3rd week after admlssion.		Within 4th week after admission.		Within 5th week after admission.		Within 6th week after admission.	
		No.	Percentage of total no. developing complications.	No.	Percentage of total no. developing complications.	No.	Percentage of total no. developing complications.	No.	Percentage of total no. developing complications.
Plaistow H., West Ham. 21 mths.	552	175	81·0	40	18·5	1	0·4	0	—
Cardiff Sanatorium 1922–3–4.	700	192	85·7	19	8·4	6	2·6	7	3·1
Swindon and District Isolation H. 2 years.	139	43	71·7	8	13·3	3	5·0	6	10·0
Group B. City Hospital, Newcastle, 1924.	500	27	42·8	29	46·0	7	11·1	0	—
Borough Sanatorium, St. Helens,* 1923–4.	462	21	65·6	6	18·7	0	—	5	15·6
I. D. Hospital, Wallasey,* 1923–4.	150	5	100·0	0	—	0	—	0	—
Ham Green H., Bristol. June, 1923–December, 1924	500	86	74·7	20	17·3	6	5·2	3	2·6

The statistics as supplied from the Birkenhead Infectious Diseases Hospital cannot be easily brought into the above table and are therefore set out below in their original context.

1. The cases reviewed in the investigation (759 in number) were those admitted to the Birkenhead Fever Hospital during the years 1922, 1923 and 1924. (See Chart 3 opposite.)

* At these hospitals the patients remain under the care of the practitioners who sent them in.

CHART 3.



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2. For convenience of grouping 5-day periods were adopted as follows:—

Onset — 5th day
6th day — 10th ,,
11th day — 15th ,,
etc.

3. The average length of stay in hospital of all cases notified as scarlet fever during the period under review was 37 days.

4. The usual period of isolation of uncomplicated cases was 28 days.

5. The complications considered were :—

Adenitis	in	86	cases	(11·33	per	cent.	of	total)
Otorrhœa	,,	43	,,	(5·66	,,	,,	,,	,,)
Rhinitis	,,	37	,,	(4·87	,,	,,	,,	,,)
Arthritis	,,	15	,,	(1·97	,,	,,	,,	,,)
Albuminuria	,,	12	,,	(1·58	,,	,,	,,	,,)

6. *Adenitis.*

Day of Disease on which complication occurred.	*No of cases.*	*Percentage of total number of cases reviewed.*
0— 5	2	0·26
6—10	27	3·55
11—15	11	1·44
16—20	20	2·60
21—30	6	0·79
31—35	5	0·65
36—40	1	0·13
41—45	1	0·13

7. *Otorrhœa.*

0— 5	2	0·26
6—10	10	1·31
11—15	8	1·05
16—20	5	0·65
21—25	5	0·65
26—30	3	0·39
31—35	4	0·52
36—40	2	0·26
41—45	1	0·13
46—50	2	0·26
51—55	1	0·13

8. *Rhinitis.*

0— 5	9	1·18
6—10	8	1·05
11—15	4	0·52
16—20	3	0·39
21—25	7	0·92
26—30	2	0.26
31—35	2	0.26
36—40	1	0 13
41—45	1	0·13

9. *Arthritis.*

0— 5	3	0·39
6—10	4	0·52
11—15	4	0·52
16—20	2	0·26
21—25	2	0·26

10. *Albuminuria.* Onset occurred as follows :—

0— 5	1	0·13
6—10	2	0·26
11—15	1	0·13
16—20	3	0·39
21—25	3	0·39
26—30	1	0·13
31—35	1	0·13

From the statistical evidence set out above it will be seen that in every hospital except that at Newcastle the great majority of complications appear during the third week of hospital isolation ; in most hospitals also it is the fourth week during which the next

highest incidence of complications occurs, but at Newcastle more complications occurred in the fourth than in the third week; in four hospitals it is the sixth, and not the fifth week, which comes next in order as a "complication week."

Dr. Hauxwell notes that out of the 462 cases reviewed at the Borough Sanatorium, St. Helens, ten patients on admission suffered from otorrhœa and one from albuminuria; one patient developed rheumatism within the first week; and during the second week one case of adenoids and five cases of otorrhœa were discovered. There were six deaths, of which five were due to septic scarlet fever. These cases above are not included among the returns summarised in Table 25.

At the Wallasey Infectious Diseases Hospital, also, the second week proved to be the most productive as regards the crop of complications during the years 1923 and 1924, and the 18 cases allocated to the second week do not appear in Table 25.

> Dr. Naylor Barlow writes:—"Our experience here is that the complications develop early if there are going to be any. There has been a remarkable absence of complications in the later stages. We have visited every one of the 150 cases and found only 4 whose illness can in any way be attributable to scarlet fever, and even in these the connection between the two is very doubtful."

In the Cardiff Sanatorium, Dr. Picken notes "that the proportion of all complications which occurred after the end of the fourth week was relatively trifling."

At Swindon, on the other hand, three of the six cases recorded in Table 25 as occurring within the sixth week after admission occurred actually on the 43rd, 56th and 62nd days respectively.

Dr. Brewer adds the following comments in his returns:—

> "It will be noted that the majority of the complications occur within the first three weeks; but it is important to recognise that many of the most serious complications occur later; nephritis is commonest after the fourth week; true scarlatinal rheumatism after the fifth week; severe angina at any time up to six or seven weeks, often following a secondary sore throat. Otorrhœa also may occur at any time after scarlet fever, even a year or two afterwards, and still be due to the scarlet fever as is proved by such cases spreading infection.
>
> "I have added to your list secondary sore throat as a somewhat important complication of scarlet fever in connection with stay in hospital. It generally occurs about the eleventh day.
>
> "If the complications during the first three weeks were split up it would be noticed that the majority of these early complications occur somewhere about the eleventh day. If the blood of scarlet fever patients is examined systematically it will be found that leucocytosis gives place to leucopœnia about this time.
>
> "Any case of scarlet fever, however mild, may develop complications about this period, i.e. within the first three weeks, but the complications that occur afterwards are generally expected, i.e. they occur in cases which have been severe or unsatisfactory."

As regards particular complications, the returns show that adenitis in nearly every hospital concerned is the complication most frequently recorded and next in order, but some distance lower down, come otorrhoea and septic conditions. With one exception, all these three complications are noted as occurring almost ex-

clusively within the third week; in Wallasey hospital they occur chiefly in the second week.

Figures concerning the comparative frequency and period of onset of renal complications are analysed below.

TABLE 26.

RENAL COMPLICATIONS; *frequency and period of onset.*

Hospital.	No. of cases reviewed	Period concerned.	No. of cases of renal complications.	Percentage of total complications.	Percentage of total no. of cases reviewed	Week of chief incidence
Monsall ..	500	1924, Jan.–June.	42	16·3	8·4	3rd 78·5%
Fazakerley	500	1924	14	9·2	2·8	4th 64·3%
Plaistow ..	552	21 months	39	18·0	7·0	3rd 69·2%
Cardiff ..	700	1922, 1923, 1924	41	18·3	5·8	3rd 73·1%
Swindon ..	139	Ap. 1923—Mar. 1925	7	11·6	5·0	4th 57·0%
Newcastle ..	500	1924	3	4·7	0·6	3rd 100·0%
St. Helens ..	462	1923, 1924	1	3·1	0·2	4th 100·0%
Wallasey ..	150	do.	3	60·0	2·0	3rd 100·0%
Birkenhead	759	1922, 1923, 1924	12	6·7	1·5	3rd 50·0% approx.
Bristol ..	500	June, 1923—Dec. 1924	14	12·1	2·8	4th 57·1%

From this analysis it would seem that nowadays renal complications (albuminuria and hæmaturia) are comparatively infrequent among scarlet fever patients in hospital, and that among complications generally those of the kidneys are comparatively rare.* In six out of the eight hospitals as shown in the table above the main incidence of renal complications was in the third week; in the other four hospitals they are noted chiefly in the fourth week. It appears, however, from additional notes supplied by Dr. Mussen that the majority of renal complications at the Fazakerley Hospital occurred during the first two weeks of hospital treatment; and a more comprehensive table is given below which includes all cases of renal complications according to their time-periods of incidence.

* Caiger gives 11·9 as the percentage incidence of renal complications (albuminuria and nephritis) among scarlet fever patients treated at the South Western Fever Hospital during the years 1895 to 1904. (Allbutt and Rolleston's System of Medicine, 1912, II, Pt. I, p. 452.)

TABLE 27.

Time incidence of RENAL COMPLICATIONS.

Hospital.	In 1st and 2nd weeks.	In 3rd week.	In 4th week.	In 5th week.	In 6th week.	After 6 weeks.
Monsall	—	33	5	1	3	—
Fazakerley	25	1	9	4	0	—
Plaistow	—	27	11	1	0	—
Cardiff	—	30	7	3	1	—
Swindon	—	2	4	1	0	0
Newcastle	—	3	0	0	0	—
St. Helens	—	0	1	0	0	—
Wallasey	0	3	0	0	0	0
Birkenhead	4	6	1	1	—	—
Bristol	—	5	8	1	0	0
Totals	29	110	46	12	4	0
Percentages ..	14·0	54·7	22·8	6·0	2·0	0

Reviewing Tables 26 and 27 as a whole it appears that the "short-stay hospitals" compare very favourably with the "long-stay hospitals" as regards the incidence of complications. The results are summarised below.

TABLE 28.

Percentage incidence of COMPLICATIONS (*during the 3rd, 4th, 5th and 6th weeks*), *in "long-stay" and "short-stay" hospitals.*

Hospital.	Percentage of patients developing complications of one kind or another.	Percentage of patients developing particular complications.						
		Adenitis.	Cardiac complications.	Cellulitis.	Otorrhœa.	Renal complications.	Rheumatism.	Septic conditions.
	1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*
Monsall	51·4	15·0	2·4	0·2	11·4	8.4	2·4	9·6
Fazakerley ..	30·2	12·0	3·0	1·2	6·0	2·8	1·2	4·0
Plaistow	39·1	14·5	1·0	1·6	7·6	7·0	2·3	4·8
Cardiff	32·0	10·7	0·2	0·0	5·1	5·8	3·2	6·7
Swindon	38·8	8·6	2·1	2·1	8·6	5·0	2·8	10·7
Newcastle ..	12·6	5·0	0·6	0·2	2·2	0·6	2·6	1·2
St. Helens ..	6·9	2·3	0·0	0·0	3·2	0·2	0·0	1·0
Wallasey ..	3·3	0·6	0·0	0·0	0·6	2·0	0·8	0·0
Birkenhead ..	25·4	11·3	—	—	5·6	1·5	1·9	4·8
Bristol	23·0	6·0	1·4	0·4	8·0	2·8	3·2	1·2

It should be mentioned that the figures in the first column of percentages are individually liable to error and are possibly exaggerated ; this, because a single patient may be credited with two or more complications and the data figures may represent complications rather than the number of patients developing these complications ; comparatively, however, these figures form a rough estimate of the relative incidence of complications among the various hospitals. The figures in the other columns are not open to the same objections. The figures for Fazakerley Hospital in column 6 would, of course, be higher if the cases occurring in the first two weeks had been considered, but since only one other reporter referred to cases in the first two weeks the comparison was confined to data for the 3rd, 4th, 5th and 6th weeks.

The enquiries concerning the *after-histories* of scarlet fever patients were naturally more difficult than those dealing with the complications contracted by patients while still in hospital ; and certain reporters are careful to state that some of the after-histories, furnished by parents, are of doubtful value. At the same time a considerable amount of useful following-up enquiry has been carried out in the nine districts concerned, and out of a total number of 2,371 cases reviewed over 2,000 discharged patients have been traced and their medical histories investigated. The cases were considered in three groups, according to the time that had elapsed since the patient left hospital, and the figures below show, for eight districts, the relative proportions of cases in this respect.

TABLE 29

Arranges the cases in which AFTER-HISTORIES *were investigated according to the length of time since the patients were discharged from hospital.*

F. Hospital in which patient was treated.	Total number of cases reviewed.	Length of time since patient's discharge.		
		3—6 months ago.	6—12 months ago.	More than 12 months ago.
Monsall	490	301	189	0
Fazakerley	261	125	136	0
Plaistow	500	161	173	166
Cardiff	104	33	71	0
Swindon	112	16	3	93
St. Helens	158	67	91	0
Wallasey	150	33	40	77
Ham Green, Bristol..	500	0	104	396

The information obtained regarding the after-histories of scarlet fever patients is summarised in Tables 31 and 32, and the carefully compiled records from Bristol—where the great majority of children examined had been discharged from hospital over 12 months previously—are incorporated as a whole in Appendix I.

The conventional distinction previously drawn between "long-stay" and "short-stay" hospitals was based on the internal evidence of the original questionnaire returns: in the case of the Monsall, Fazakerley, Plaistow, Cardiff and Swindon hospitals (Group A) the stated minimum period of hospital detention was comparatively high and the statistical returns showed that in practice also the average length of stay in these hospitals was a comparatively long one; in the fever hospitals of Bristol, Birkenhead, St. Helens, Newcastle and Wallasey (Group B), on the other hand, the questionnaire reports showed that a comparative short stay in hospital was favoured both as a policy and in practice. The supplementary enquiry under discussion shows that this differentiation holds fairly good as regards the cases which were specially reviewed on this occasion. The "long-stay hospitals" certainly maintain their position in Group I, and as regards four out of five of them the great majority of followed-up patients had been in hospital for a period of 35–41 days, while the Cardiff patients had most of them been in hospital over 41 days. As regards the "short-stay hospitals," the majority of patients followed-up at Bristol and St. Helens belonged to the 28–34 days detention group; but at Bristol 25 per cent. of the patients examined had been in hospital over 41 days and the length of stay distribution of Wallasey's cases qualifies this hospital, on present showing, for a place in Group I. Dr. Naylor Barlow expresses frank surprise at his own figures, but explains them by the fact that the incidence of scarlet fever being low at the time and plenty of bed accommodation being available, patients (and especially delicate children) were deliberately kept in longer than usual to feed them up before discharge.

TABLE 30

Groups the discharged patients under review according to their PERIODS OF DETENTION *in hospital.*

Hospital.	Percentage proportions.				
	Under 21 days.	21–27 days.	28–34 days.	35–41 days.	Over 41 days.
Manchester	0	5·3	20·6	73·9	0
Liverpool	0	4·2	16·4	79·3	0
Plaistow..	0	8·8	8·4	82·8	0
Cardiff	0·9	2·8	2·8	8.6	84·6
Swindon..	0	2·7	15·2	82·1	0
St. Helens	0	3·8	68·9	27·2	0
Wallasey	1·3	5·3	27·3	43·3	22·6
Bristol	2·8	9·8	46·6	15·8	25·0

In Table 31 below the main results of the enquiries into after-histories are set out. In four-fifths of the total number of cases reviewed it was found that the discharged patient had not suffered from any illness attributable to scarlet fever; there were 11·2 per cent. of cases in which the patient's subsequent illness was so attributed; and only 7·8 of the discharged patients could not be traced. It will be seen that the total results in Group II are somewhat better in each respect than the total results for Group I. More than 50 per cent. of the data was supplied by the Monsall, Plaistow and Ham Green hospitals, and of these three the latter had the smallest proportion of patients affected with scarlatinal sequelae, while the first showed the best record as regards return cases. The percentage of untraced patients in West Ham is remarkably low, and Bristol's figure is also considerably lower than most others.

TABLE 31

Shows the main results of enquiries into the AFTER-HISTORIES *of Scarlet Fever patients discharged from certain hospitals.*

Hospital.	Number of cases reviewed	Percentage of patients with no history of sequelæ.	Percentage of patients who suffered from sequelæ possibly attributable to scarlet fever.	Percentage of patients untraced	Return case rate.
Group I.					
Monsall Hospital, Manchester ..	490	76·9	13·2	9·7	1·8
Fazakerley Hospital, Liverpool ..	261	73.9	8·4	17·6	3·8
Plaistow Fever Hosp., West Ham ..	500	81·6	16·4	2·0	3·6
Cardiff Sanatorium..	104	86·5	3·8	9·6	0
Swindon and District Fever Hospital ..	112	68·7	6·2	25·0	2·6
Totals for Group I...	1,467	78·0	12·2	9·0	2·7
Group II.					
Birkenhead Fever Hospital	96	90·6	9·3	—	—
St. Helens Sanatorium	158	86·0	8·2	5·7	3·8
Wallasey Fever Hospital	150	86·0	2·6	11·3	0
Ham Green Hospital, Bristol	500	84·6	12·0	3·4	2·6
Totals for Group II..	904	85·7	9·5	4·7	2·1
Totals for all Hospitals combined	2,371	80·9	11·2	7·8	2·4

Table 32, which follows, gives more details and correlates the occurrence of subsequent illnesses and return cases with the various periods for which the patients were primarily detained in hospital during their scarlet fever treatment. The table shows that in most instances the highest percentages of persons affected with sequelæ were in regard to patients whose stay in hospital was 21 to 27 days,

TABLE

Classifies and arranges, according to their primary periods of hospital from certain

Hospital.	Total No. of cases under review.	Length of													
		Under 21 days.						21–27 days.							
		Patients discharged.		Patients who suffered from sequelæ		Associated return cases.		Patients discharged.		Patients who suffered from sequelæ.		Associated return. cases		Patients discharged.	
		No.	Per cent. of 2	No.	Per cent. of 3	No.	Per cent. of 3	No.	Per cent. of 2	No.	Per cent. of 9	No.	Per cent. of 9	No.	Per cent. of 2
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Group A.															
Monsall H., Manchester.	490	0	—	—	—	—	—	26	5·3	7	26·9	0	—	102	20·8
Fazakerley H., Liverpool.	261	0	—	—	—	—	—	11	4·2	2	18·1	0	—	43	16·4
Plaistow F.H., West Ham.	500	0	—	—	—	—	—	44	8·8	9	20·4	2	4·5	42	8·4
Cardiff Sanatorium	104	1	0·9	0	—	0	—	3	2·8	0	—	0	—	3	2·8
Swindon and District F.H.	112	0	—	—	—	—	—	3	2·7	0	—	0	—	17	15·2
Group B.															
St. Helens, Borough H.	158	0	—	—	—	—	—	6	3·8	1	16·6	0	—	109	68·9
Wallasey F.H.	150	2	1·3	1	50·0	0	—	8	5·3	1	12·5	0	—	41	27·3
Ham Green H., Bristol.	500	14	2·8	0	—	0	—	49	9·8	5	10·2	1	2·0	233	46·6

and that as the period of stay increases the percentage of patients subsequently becoming ill decreases. Bristol, however, provides an exception, and its records show that it was among those patients who were kept in hospital over 41 days that the greatest proportion suffered from subsequent illnesses, and the next highest figure occurs in the 35–41 days group.

32.

detention, the SUBSEQUENT HISTORIES *of Scarlet Fever patients discharged hospitals.*

patients' stay in hospital															
28–34 days.				35–41 days.						Over 41 days.						Untraced patients.
Patients who suffered from sequelæ.		Associated return cases.		Patients discharged.		Patients who suffered from sequelæ.		Associated return cases.		Patients discharged.		Patients who suffered from sequelæ.		Associated return cases.		
No.	Per cent. of 15	No.	Per cent. of 15	No.	Per cent. of 2	No.	Per cent. of 21	No.	Per cent. of 21	No.	Per cent. of 2	No.	Per cent. of 27	No.	Per cent. of 27	
17	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*
13	12·7	2	2·0	362	73·9	45	12·4	7	1·9	0	—	—	—	—	—	48
3	6·9	0	—	207	79·3	17	8·2	10	4·8	0	—	—	—	—	—	46
8	19·0	1	2·3	414	82·8	65	15·7	15	3·6	0	—	—	—	—	—	10
0	—	0	—	9	8·6	0	—	0	—	88	84·6	4	4·5	0	—	10
0	—	0	—	92	82·1	7	7·6	3	3·2	0	—	—	—	—	—	28
9	8·2	6	4·5	43	27·2	3	9·3	1	2·3	0	—	—	—	—	—	9
1	2·4	0	—	65	43·3	1	1·5	0	—	34	22·6	0	—	0	—	17
18	7·7	4	1·7	79	15·8	11	13·9	2	2·5	125	25·0	26	20·8	6	4·8	17

Finally, Table 33, below, gives details concerning the nature and comparative frequency of the after-illnesses which were thought to be the result of previous scarlet fever infection. The sequelæ most often mentioned in order of frequency are morbid conditions of the ear, rheumatism, adenitis, cardiac complications, throat affections and renal disorders ; these sequelæ are of the same nature as the previously discussed complications occurring during treatment in hospital in the following order of frequency, adenitis, ear complications, renal complications, septic complications, rheumatism and cardiac complications. The data concerning the time after discharge that the sequelæ were first noticed are not sufficient in quantity or precision to yield any safe conclusions on this point. Such information as is given shows that as a general rule rhinitis and sore throat occur within two or three days after discharge ; otorrhœa, tonsillitis, adenitis and rheumatism within two weeks ; and the other conditions at varying intervals. This rather suggests that the commoner sequelæ may often be relics of complications which originated during hospital treatment and that morbid conditions which had been suppressed or cured while the patient was under treatment appear or re-appear, as the case may be, when the patient leaves the discipline and supervision of hospital life for the less satisfactory conditions of his home.

It will be further seen from the table below that the various after-illnesses are most often related to patients who were detained in hospital for 35 to 41 days, but this is due to the fact that most of the cases reviewed fall into that group and it does not necessarily follow that the long-stay patients are more prone to subsequent illnesses ; in many cases, no doubt, the long stay is on account of complications that have occurred, or seemed likely to occur, while in hospital.

TABLE 33.

CLASSIFIES THE VARIOUS DISEASES OR DISABILITIES RECORDED IN THE AFTER-HISTORIES *of those patients whose illnesses subsequent to discharge were considered attributable to Scarlet Fever. The table also shows the frequency with which the various forms of illness are reported and relates them with the hospital-detention periods of the patients to whom they are credited.*

Nature of illness subsequent to discharge.	Total no. of times recorded.	Length of stay in hospital.					Remarks.
		Under 21 days.	21–27 days.	28–34 days.	35–41 days.	Over 41 days.	
Adenitis	33	1	2	7	20	3	Chiefly swollen glands of the neck.
Affections of Ear :							
" Aural trouble "	4	–	–	–	4	–	
Deafness	7	–	–	2	5	–	
Ear-ache	5	–	–	1	3	1	
Mastoid operation	4	–	–	2	–	2	
Otitis media ..	3	–	–	1	2	–	
Otorrhœa ..	35	–	1	8	20	6	" Running ears " ; " ear discharge," etc.

Nature of illness subsequent to discharge.	Total no. of times recorded.	Length of stay in hospital.					Remarks.
		Under 21 days.	21–27 days.	28–34 days.	35–41 days.	Over 41 days.	
Affections of Eye :							
" Eye trouble " ..	1	–	–	–	1	–	
Conjunctivitis ..	4	–	1	1	2	–	
Affections of Nose :							
Epistaxis.. ..	1	–	–	–	1	–	
Rhinitis	18	–	2	6	10	–	" Running nose " ; " rhinorrhœa," etc.
Affections of Throat:							
" Sore throat " ..	14	–	1	2	9	2	
Tonsillitis ..	13	1	3	5	4	–	
" Tonsils and adenoids "	5	–	–	–	4	1	
Circulatory system :							
Anæmia	2	–	–	–	2	–	
Cardiac	32	–	3	4	19	6	" Cardiac trouble "; " weak heart," etc. One patient died of endocarditis.
Digestive system :							
Gastritis	2	–	1	–	1	–	
Jaundice	–	–	–	–	1	–	
Excretory system :							
Albuminuria ..	1	–	–	–	1	–	
Enuresis	3	–	1	–	–	2	Including one case of " frequent micturition."
Hæmaturia ..	1	–	–	–	–	1	
Nephritis.. ..	18	–	–	4	8	6	" Kidney trouble " ; " renal complications," etc.
Nervous system :							
Chorea	3	–	–	1	1	1	One case of doubtful diagnosis.
Meningitis ..	2	–	–	–	–	2	One case fatal.
" Nervous debility"	3	–	1	1	1	–	
Respiratory system :							
Bronchitis ..	5	–	–	1	4	–	
Broncho-pneumonia	1	–	–	1	–	–	
Cough	1	–	–	–	1	–	
Pneumonia ..	4	–	1	–	3	–	
Rheumatic Fever ..	2	–	1	–	1	–	
Rheumatism ..	46	–	9	8	27	2	
Specific infectious diseases :							
Croup	1	–	–	1	–	–	Fatal case.
Diphtheria ..	2	–	1	1	–	–	
Measles & Mumps	1	–	–	–	1	–	(Plaistow Hospital)
Scarlet Fever ..	1	–	–	–	1	–	Second attack (Plaistow Hospital).
Whooping Cough	1	–	–	1	–	–	

Nature of illness subsequent to discharge.	Total no. of times recorded.	Length of stay in hospital.					Remarks.
		Under 21 days.	21–27 dayt.	28–34 days.	36–41 days.	Over 41 days.	
Various :							
Abscesses ..	3	–	–	1	1	1	
Debility	16	–	2	4	10	–	
Eczema	1	–	–	1	–	–	
"Fallen instep"	1	–	–	–	1	–	Requiring operation and said to be the result of post scarlatinal debility.
Headache ..	3	–	–	–	2	1	
Impetigo	1	–	1	–	–	–	
Lumbar pain ..	1	–	1	–	–	–	Exclusive of cases in which the probable cause is also mentioned.
"Sores"	2	–	–	2	–	–	
Swollen ankles ..	2	–	–	2	–	–	
Tuberculous peritonitis	1	–	–	1	–	–	
Vaginitis	1	–	–	–	–	1	
Wasting	1	–	–	–	1	–	

Minimum Length of Stay in Bed. (*Quest.* 7*e.*)

By far the commonest answer to this query is "three weeks," as will be seen from the summary below.

TABLE 34.

Minimum Length of Stay in Bed.

Minimum number of days patient is kept in bed.	Number of hospitals in which such period is observed.
14	4
14–21	3
16–20	1
18	1
21	24
4 days after temperature is normal.	1 (Burnley)
10 ,, ,, ,, ,, ,,	1 (Rochester)

At Bradford the varying period of 16–20 days makes allowance for season and weather ; in other hospitals the time varies according to the severity of the case, while at Hornsey Dr. Prior allows no patient to get up under 21 days—however mild his attack—"for fear of nephritis."

(7) Return Cases. (*First issue Section B.* 10 *and* 14; *Section C. Column* 11. *Second issue Section B.* 6 (*b*); *Section C. Columns* 13, 14 *and* 15 (*b*)).

The question of return cases has not in itself been made the subject for special investigation in the present hospital inquiry. There are references to the matter, however, in the inquiries about standard bed-space and about the experiences upon which the conditions of discharging scarlet fever patients have been framed in the various hospitals; in the statistical section also, more direct information has been sought and obtained. It will be convenient, therefore, to gather and consider here the various indirect and direct references to the subject which occur in the hospital questionnaires. First it may be stated that the *definition of a "return case,"* as given by most of the hospital superintendents, is comprised in some such sentence as the following:—"A case of scarlet fever which occurs in a house to which a patient has been discharged from the hospital within the preceding 28 days." As a rule it is stated or implied that the return case arises in the same house or family to which the supposed "infecting" case belongs, but in three instances there is not this domestic limitation and the term is evidently meant to include any contact whose subsequent attack, within a time-limit, can be attributed to his association with a recently discharged hospital patient. The definition, moreover, in all but one instance, limits the infection to patients discharged from hospital. In the majority of definitions the time-limit is set at 28 days; in three it is 21 days; in four 14 days; in two instances it is as low as 7 and 10 days respectively. On the other hand 6 to 8 weeks is the period used at three hospitals; 12 months is allowed at Brighton, while at Bury and Willesden no limit is fixed. In two definitions the time-limit includes also a minimum period, 24 and 48 hours respectively, for which the returned hospital patient must have been at home before he can be considered as a possible *infecting case.* One or two reporters definitely state, what is evidently implied by the majority of the rest, that *return cases* only include those secondary cases that cannot be traced to any other source. At Rochester the occurrence of a secondary case in a house shortly after the return of a patient from hospital is not considered as necessarily due to infection by the discharged patient unless he develops a discharge from nose or ear. Finally, one medical superintendent "does not admit the occurrence" of "return cases" caused by recently discharged hospital patients, but states that "return cases seem to follow clothes stored, hidden, etc., and not disinfected."

The opinions upon the things concerned, or unconcerned, with the occurrence of return cases are set out in Table 35 below.

TABLE 35.

Opinions regarding the ORIGIN OF RETURN CASES.

Opinions concerning return cases.	Hospitals at which these opinions are held.
1. Lowering of standards for bed-space (overcrowding) leads to an increase in the number of return cases.	Guildford, Hornsey, Rochdale, Southampton, Wallasey, Willesden.
2. No evidence that this (1) is the case.	Eighteen hospitals.
3. Discharges from the nose, throat or ear largely responsible for return cases.	Brighton, Croydon, Hove, Shrewsbury (includes also inflamed eyes), Willesden, York.
4. Number of return cases is increased by premature discharge of convalescents.	Croydon, Warrington.
5. Number of return cases *not* increased by diminishing the length of stay in hospital of uncomplicated cases.	Bristol, Brighton, Norwich.
6. "Mere length of stay does not keep down return cases."	Leicester.
7. Number of "return cases" diminished by reducing the minimum length of stay in the case of uncomplicated cases to 28 days.	Blackburn, Newcastle.
8. Desquamation has no effect on the incidence of return cases.	Brighton.
9. Final segregation in an uninfected block does not decrease the number of return cases.	Fazakerley.
10. Continued use of wards without periodical disinfection suspected to be a cause of return cases.	Coventry.

The statistical information concerning the infecting case-rate, given in Section C of the hospital questionnaires, is variable in extent and not easily correlated, but the table below gives statistics

of those hospitals from which more or less complete returns for the last ten years have been received.

TABLE 36.

INFECTING CASE-RATE *at various hospitals for years* 1913–22.

Hospital.	Number of admissions (italics) and infecting case-rate as a percentage of discharges.									
	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
Bedford (*a*) ..	*245*	*87*	*102*	*39*	*20*	*68*	*101*	*106*	*80*	*111*
	2·4	6·9	1·9	0·0	0·0	2·9	6·9	4·7	1·3	2·7
Blackburn (*b*) ..	*196*	*560*	*360*	*101*	*68*	*122*	*105*	*164*	*171*	*186*
	0·0	5·0	3·3	0·9	0·0	0·0	0·9	0·6	1·1	1·0
Brighton (*c*) ..	*615*	*393*	*233*	*198*	*169*	*173*	*120*	*275*	*382*	*252*
	5·0	2·5	3·5	2·5	0·0	2·3	1·7	2·2	4·7	5·2
Bristol (*d*)	*500*	*928*	*470*	*353*	*95*	*219*	*249*	*665*	*382*	*722*
	1·4	1·1	0·2	1·1	3·0	0·0	0·5	0·6	0·0	0·5
Bromley (*e*) ..	*251*	*198*	*183*	*158*	*83*	*74*	*101*	*266*	*286*	*366*
	3·5	4·8	3·5	2·9	1·1	3·1	2·7	3·0	3·4	4·8
Derby (*f*)	—	*291*	*440*	*224*	*165*	*134*	*107*	*277*	*421*	*331*
	—	3·4	3·0	2·2	2·4	2·2	1·9	2·5	1·9	1·5
Doncaster (*g*) ..	—	*222*	*168*	*147*	*71*	*52*	*42*	*53*	*44*	*68*
	—	2·1	6·2	4·6	4·3	2·0	5·6	3·4	2·1	3·2
Leicester (*h*) ..	*548*	*577*	*382*	*647*	*573*	*583*	*579*	*946*	*714*	*619*
	3·0	3·2	2·6	—	—	2·5	1·2	1·0	1·0	1·6
Monsall (*i*) ..	*2247*	*2623*	*2303*	*952*	*745*	*672*	*1260*	*2481*	*3173*	*2643*
	3·3	2·1	2·3	1·7	1·8	2·0	2·2	3·3	4·0	3·9
Newcastle (*j*) ..	*853*	*1404*	*1305*	*677*	*409*	*381*	*630*	*1105*	*1115*	*560*
	2·7	5·6	3·3	3·3	2·2	3·4	3·6	3·3	2·1	1·6
Norwich (*k*) ..	*254*	*553*	*199*	*206*	*140*	*133*	*97*	*145*	*112*	*546*
	1·2	0·5	2·0	2·4	1·4	—	—	1·4	2·6	1·8

(*a*) Barrier system in certain cases; minimum length of stay in hospital 42 days; desquamation must be complete.
(*b*) Barrier system for all septic cases and early segregation of cases of rhinitis and otorrhœa; uncomplicated cases discharged on 28th day.
(*c*) Ordinary ward isolation; no discharge of patients until after fourth week.
(*d*) Bed-isolation of all acute cases; fresh air treatment started 1914; average period of detention has been reduced from 8 to 5 weeks in recent years.
(*e*) Ward-isolation mainly; minimum period of stay for adults 4 weeks, for children under sixteen, 5 weeks.
(*f*) Open air as much as possible; wall space between beds 9 feet; minimum length of stay 35 days.
(*g*) Ward-isolation; desquamation must be complete.
(*h*) Ward-isolation; patients discharged end of fourth week.
(*i*) Barrier nursing (previously unsuccessful); bed-isolation ward and appointment of an otologist are under consideration.
(*j*) Ward-isolation usually; uncomplicated cases discharged on 28th day; all ear complications treated by an otologist on the staff.
(*k*) Ward-isolation as a rule; desquamation disregarded but feet painted with iodine.

Here may be reproduced in the table below some interesting figures sent by the Medical Officer of Health for Liverpool concerning the average length of detention and the return case-rates in the city hospitals which receive scarlet fever cases. The records on the whole do not support the contention that return cases are reduced by increasing the average duration of stay in hospital. We have referred above to Dr. Greenwood's statistical analysis of the data of several hospitals which leads to the same conclusion.

TABLE 37.

Liverpool Fever Hospitals; AVERAGE PERIODS OF DETENTION AND RETURN CASE-RATES.

—	1920		1921		1922	
Hospital.	Percentage of patients giving rise to return cases.	Average duration of stay, in days.	Percentage of patients giving rise to return cases.	Average duration of stay, in days.	Percentage of patients giving rise to return cases.	Average duration of stay, in days.
Fazakerley ..	1·1	42	1·5	53	2·4	50
Netherfield Rd.	3·0	54	3·7	47	3·9	55
Grafton Street	3·0	49	5·0	56	3·7	53
Deysbrook ..	1·5	67	3·1	58	4·6	63
Whole City ..	1·8	57	2·7	53	3·4	55

(8) APPOINTMENT OF OTOLOGISTS TO THE STAFF OF FEVER HOSPITALS. (*Hosp. forms: first issue, Sect. B., Q.* 8; *second issue, Sect. B. Q.* 10.)

The inclusion of this question was prompted by a consideration of the experiment made by the Metropolitan Asylums Board in 1920, when they appointed an otologist to the North-Eastern and Western Fever Hospitals in London under the following terms :—

> "The duties are to visit each hospital at least twice a week, or more often if assistance is urgently required, and examine those patients whom the Medical Superintendent may put forward for the opinion of the otologist, advise as to their necessary treatment and perform such operations as may be considered necessary. It is understood that the otologist will not only see patients who are suffering from chronic ear discharge, but also examine and treat those in whom the middle ear is inflamed though not yet discharging."

The otologist in question, Mr. T. B. Layton, issued a report (77*a*) on the results of a year's work from July, 1920, to June, 1921. In this report Mr. Layton made various suggestions for a definite policy "to prevent the occurrence of chronic ear disease as a sequela of the infective fevers." Speaking generally, the medical superintendents concerned agreed with Mr. Layton's proposals and recommended that they should be put to the test for a period of

twelve months at one hospital, the Western, only. The result of this extended experiment and the present policy of the Metropolitan Asylums Board, as regards the appointment of otologists, is briefly summarised in the footnote below.*

The answer to the question: "Do you employ a specialist for the purpose of treating radically chronic morbid conditions of the nose, throat and ear?" was, with few exceptions, "No." In many cases this negative was qualified by the statement that a specialist was called in when necessary and especially for acute conditions, such as mastoid abscess, where an operation was needed. It was further added in two or three instances that such occasions arose but seldom, and one reporter stated that the services of a specialist had only been required by him twice in 20 years. At one hospital the services of a specialist were used for the removal of adenoids and tonsils; at other institutions this operation was performed by a general practitioner of the neighbourhood or by a member of the hospital staff.

One medical superintendent writes: "I am permitted to get in what outside help I need, but I only require it for radical mastoids when the lateral sinus or cranium has to be opened. All others I do myself; no patient has died here from mastoid disease during the last ten years."

A small minority of reporters state that they do not consider it advisable for any radical treatment of ear discharge to be undertaken until some time after convalescence; but in such cases the

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* As a result of a short report on the work carried out at the Western Hospital during April, 1922—April, 1923, the Board decided that for a period of a year the scheme should be put into action at the North Eastern and Eastern Hospitals under Mr. Layton's weekly supervision and continued for a further year at the Western Fever Hospital by the senior medical officer under Mr. Layton's less close supervision. A report on the work carried out at these three hospitals is contributed to the Report of the M.A.B. for 1924–5 (77b). Following to some extent the proposals of Mr. Layton therein, the Board "decided that the work at the Western Hospital, where it has been carried on longer than elsewhere, might continue without any supervision from Mr. Layton, that another hospital—the North Western—should be brought into the scheme, and, along with the North-Eastern, be visited at least once a week by Mr. Layton, and that the Eastern Hospital should take the place occupied under the existing scheme by the Western Hospital and be visited by Mr. Layton only when he is called upon." The Board also agreed that 12–20 beds should be set aside at the North-Eastern Hospital for the experimental sunlight treatment of certain cases of ear disease. Reviewing the cases that have come under his care, Mr. Layton roughly divides them into those "in whom the ear disease tends to heal with moderate rapidity" and "before the patient is fit to go out for other reasons"; and "those in whom it is a matter of the utmost difficulty to get well." Mr. Layton observes that "we may be shortening the average stay in hospital by preventing a certain number of the first class of case passing over into the second, and I believe we are." But in another paragraph of the report he states that there is no evidence that any economy has been effected as a result of reduced stay.

Postscript.—Since the note above was written a fifth hospital (Grove) has been brought into the scheme; and for special cases Mr. Layton's services will also be available, during 1927, at all the remaining fever hospitals belonging to the Board.

parents or guardians are advised to get medical advice after the child has been discharged from hospital. Dr. Brewer (Swindon) writes :—" My candid opinion is that operations upon the throat and nose for chronic conditions are best delayed until some months have elapsed since the attack of scarlet fever. I have seen bad results, *e.g.*, bad sepsis, suppurative adenitis, etc., following the operations for enlarged tonsils and adenoids done during convalescence from scarlet fever." As a possible explanation of these bad results Dr. Brewer suggests the following : Blood examinations show that in the acute stage of scarlet fever there is a leucocytosis, which is followed in about three weeks by leucopœnia and, in cases where the glands and tonsils enlarge, lymphocytosis ; in rare cases there is lymphæmia. For these reasons Dr. Brewer would discountenance all except urgent operations after scarlet fever until the blood count has returned to normal.

On the other hand, Dr. Harries (Birmingham) writes :—

" I, at one time, held the view that it would probably not be safe to carry out these surgical procedures in fever hospitals. The experience gained during the last 4 years or so has convinced me that such fear is quite unfounded, provided due precautions are taken. Every case of scarlet fever, before any operative procedure on nose or throat, is Schick-tested, and if the Schick test is positive, the child receives, a few hours before the operation, a prophylactic dose of diphtheria antitoxin. Our aggregate of operations upon scarlet fever patients is now considerable. I can only recollect one case in which a scarlet fever patient operated upon for the removal of tonsils and adenoids contracted diphtheria, and this was one in which, by inadvertence, the preliminary prophylactic dose of antitoxin had been omitted.

We have never, so far, had an instance of scarlet fever arising in a diphtheria patient who has been operated upon, but this possible danger can now be readily met by means of the Dick test, and a prophylactic dose of scarlet fever antitoxin."

The exceptions to the general negative answer to this question were supplied by (i) Newcastle, (ii) Birmingham and (iii) Willesden.

(i) Dr. Harold Kerr, Newcastle, answered the question completely in these words :—

> " Yes, with excellent results. In the first year we effected, on an average, a saving of 15 days on each septic case which represented a saving of £1,000 on the year's working after paying all costs."

The rhinologist who has recently been appointed to the City Hospital for Infectious Diseases, Newcastle, receives £150 a year, and he deals radically with any organic defects giving rise to discharges from the nose or ear. Dr. Kerr considers that the work of this officer has already been largely responsible for reducing the average period of hospital isolation in Newcastle, which now tands at 31 days.

i) Dr. E. H. R. Harries, Medical Superintendent of *th*e

Birmingham City Hospital, Little Bromwich, gives his answer as follows :—

"Yes: Visiting otologist is attached to staff; attends regularly twice or thrice weekly. Sees all abnormal nose and ear conditions in scarlet fever wards, and does all operations for acute mastoids. All cases of scarlet fever otitis are transferred to a special ward and barrier-nursed. Those not responding to non-operative treatment carried out with head-mirror, etc., are operated upon, usually by removal of adenoids (and tonsils occasionally), paracentesis wherever feasible, and early performance of the Schartze operation combined with paracentesis when antrum is involved. Results excellent."

In a subsequent report Dr. Harries writes :—

"I have no doubt as to the value of specialised otological and rhinological work in both scarlet fever and diphtheria. In the case of scarlet fever, knowledge of the different types of aural complications is becoming much more exact both as to diagnosis and as to the selection of the most appropriate treatment. Apart altogether from the benefit to individual children of skilled otological treatment, there is, I am sure, a financial saving also, owing to the shorter duration of stay in the hospital of those cases presenting ear complications which are surgically treated.

Our Otologist (Mr. Brayshaw Gilhespy), now not only examines and treats the obvious case of otitis or rhinitis in scarlet fever wards, but also examines and treats surgically where indicated every case presenting abnormal conditions of the naso-pharynx. It is generally agreed that whether ear discharges in connection with scarlet fever otitis are infective or not—I personally believe that they are—at any rate patients with an unhealthy naso-pharynx are likely to give rise to return cases.

Our aim now is to secure that no scarlet fever patient leaves the hospital with an unhealthy condition of the naso-pharynx.

This extension of Mr. Gilhespy's work has not yet been in progress for a year. At the end of that period I hope to be able to form some estimate as to whether this work has had any effect in the reduction of return cases."

(iii) The late Dr. W. J. J. Stewart, Medical Superintendent of the Willesden Municipal Hospital, stated in his reply :—

"A throat, nose and ear specialist was attached to the hospital from 1919 to 1923. . . . Am of opinion that a throat, nose and ear specialist should be attached to all fever hospitals. Also, that medical officers of fever hospitals should hold a qualification in throat, nose and ear work."

(iv) While visiting Edinburgh, Dr. Monckton Copeman, in 1925, obtained from the late Dr. Claud Ker the following particulars regarding the appointment and work of the otologist at the Edinburgh City Infectious Diseases Hospital. The appointment was made in 1920, at the suggestion of the staff of the Royal Infirmary, and carries a salary of £300 per annum. The otologist visits the City Hospital as a rule three times a week. In 1921 there were 17 mastoid operations and 82 for the removal of tonsils and adenoids; in 1922 there were 18 and 122 operations for these conditions respectively. Dr. Ker was at first doubtful of the desirability of these operations, especially in view of producing "raw surfaces in scarlet fever wards." In one instance a patient nearly died from severe membrane formation; but this was considered due to the fact that the 500 units of diphtheria antitoxin—

which are always administered the night before such operations—was in this case omitted in error. Dr. Ker informed Dr. Copeman, however, that he had become quite satisfied with the results of the otologist's appointment: in nine out of ten cases of ear discharge, for instance, the condition cleared up within a fortnight of the removal of tonsils and adenoids; the total period of stay in hospital of cases with ear complications, over a series of years, had been reduced by 17 days, and the average cost of treating such patients correspondingly reduced. It was not considered, however, that the average cost of stay among the patients as a whole had become reduced. The operation for tonsils and adenoids was not found to have any effect on rhinorrhœa.*

(9) Conditions Governing the Discharge of Patients from Hospital. (*Hosp. forms: first issue, Sect. B., Qs. 9 and 10; second issue, Sect. B., Q. 7 b, d, f, g and h.*)

The conditions regarding a minimum length of stay in hospital and the practice of making bacteriological tests have been analysed on pages 79 and 60.

As regards discharges from the nose or ear and the condition of the throat, there is almost complete unanimity. The general rule is that no patient is discharged if he shows any signs of acute rhinitis, pharyngitis, or of otorrhœa. In four instances a period of freedom from such complications is set and this varies from 2 to 14 days; at one hospital it is stipulated that the nose must remain "dry" for three days and the ear for seven. At Willesden, "no attention is paid to normal mucous discharges (from nose or throat), however profuse."

It must be inferred that there is also a limit set to the length of time that patients with chronic discharges, especially from the ear, are retained in hospital; only twelve reporters, however, add this proviso to their general rule and the quoted periods of prolonged detention vary from 10 to 24 weeks. At Plymouth, for example, "patients are detained in hospital until all discharges cease, if possible. If an ear discharge still remains after four months in hospital the patient is sent out." It is added that "no return cases have occurred from such cases." In this last connection the late Dr. W. J. J. Stewart also remarked, "Patients are frequently sent out with purulent ear discharge—they have not led to other cases notably." Concerning Wallasey, Dr. Barlow remarks that "no case discharged from hospital with either nasal or ear discharge, or with sore throat. Cases with these complications are kept in up to three months, but they rarely occur nowadays."

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* It may be mentioned that in the Blegdams Hospital for infectious diseases, Copenhagen, all scarlet fever patients suffering from otitis are segregated in two-bedded wards where they are attended by a specialist in diseases of the throat, nose and ear; it is reported that this arrangement (started in 1915) has been found to be very satisfactory.

The importance of healing "sore places" near the mouth and nose before the patient is discharged is emphasised not uncommonly, while two or three reporters insist that the skin generally should be free of any septic lesions.

On the matter of *desquamation* there is some difference of opinion. Seventeen of the superintendents do not discharge scarlet fever patients until desquamation is complete; twelve require the skin, generally, to be clear but ignore a moderate amount of desquamation on the feet; nine ignore "late peeling" and some of these mention such periods as four, five, or six weeks after which the condition of the skin is disregarded; eleven report that desquamation is disregarded, while three others, though considering the condition of no etiological importance, are guided by the attitude of local public opinion. In one hospital it is considered politic to retain patients until desquamation is complete owing to the fact that the institution in question serves a very popular health resort.

Table 38.

Showing Return Case-rates *in Hospitals where* Desquamation *is ignored, or considered, in the discharge of Scarlet Fever patients.*

	Hospitals where desquamation is ignored.										Hospitals where desquamation is considered.									
	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923
Bristol	1·1	0·2	1·1	3·0	0·0	0·5	0·6	0	0·5											
Liverpool South																	3·0	5·0	3·7	1·0
Salford	5·2	4·1	3·7	0·66	6·9	3·3	4·1	3·9	6·7											
Manchester											2·1	2·3	1·7	1·8	2·0	2·2	3·3	4·06	3·9	
Southampton	0·39	0·59	0·61	—	—	—	—	1·75	0·30	3·4										
Plymouth											—	0·6	1·7	—	2·2	1·1	0·3	1·08	0·4	1·8
Willesden	5·0	2·7	3·6	1·2	0·8	2·9	4·8	8·7	8·4	6·5										
Doncaster											2·1	6·2	4·6	4·3	2·0	5·6	3·4	2·1	3·2	
Bromley and Beckenham ..	4·8	3·5	2·9	1·1	3·1	2·7	3·0	3·4	4·8	3·6										
Bedford											6·9	1·9	0	0	2·9	6·9	4·7	1·3	2·7	4·5
Rochdale		4·0	1·0	1·3	0	1·0	1·0	1·8	1·2	1·5										
Middlesbrough													1·5	1·8	0·7	0·3	—	—	0·4	

Using the return case-rate as a criterion a comparison is made in Table 38 between hospitals in which late peeling is ignored and those from which patients are not discharged until peeling is complete. On the whole, it does not appear that one policy has any advantage over the other. The Ladywell Sanatorium, however, compares badly with the Monsall Hospital as regards return cases; and the highest return case-rates of the series belong to Willesden, one of the hospitals in which late peeling is ignored.

In two or three instances it is mentioned that inunction with eucalyptus, or carbolic oil, is carried out in order to hasten desquamation.

With regard to the movements of patients during the last few days of their stay in hospital (f, g, and h), it would seem, as far as can be judged from the replies, that some form of *discharge block* is used at 31 hospitals out of 35, while in half this number it is the practice to segregate the patients in convalescent wards for periods varying from one to three weeks; in a few instances the convalescent wards or blocks evidently fulfil the function of a discharge block. It may be noted here that at the Fazakerley Hospital "the practice of placing patients in an uninfected building for 48 hours before discharge and after the final bath has been discarded after trial, there being no resulting diminution in the percentage of infecting cases discharged." Four reporters mention that a waiting room is used to accommodate patients who have had their final bath and are awaiting the arrival of their parents.

There is some variation in the time at which patients are removed to the discharge block, as seen in the following table :—

TABLE 39.

Practice regarding removal to DISCHARGE BLOCK.

Time of removal.	No. of hospitals at which such times are observed.
One hour before discharge	2
Morning of discharge	8
Night before discharge	4
One day before discharge	6
Two or three days before discharge	4
Seven days before discharge ..	3
Fourteen days before discharge ..	2

The *terminal bath* is mentioned as part of the discharge ritual by all except nine reporters (both sets of questionnaires), and it is probable that by some of these the question of a bath is taken for granted. At 28 hospitals the bath is given on the day of discharge; at 9 on the night before discharge; at 9 some 24 hours before discharge, and in one instance 48 hours elapse before the final bath and the patient's discharge. At one hospital the occasion varies according to the season, and the bath is given on the day of discharge in summer and on the evening before in winter.

Usually the bath takes place in the discharge block (described by some as an "out-bathing station") in some part of which the patient, after putting on clothes that are described either as "clean" or as "disinfected" (or going to bed for the night as the case may be), remains until claimed by his parents; in a few instances there is a separate waiting room apart from the discharge block where the child awaits its parents' arrival. In seven hospitals, however, it is mentioned that the bath takes place in the wards, and in four instances the patient returns to his ward bed but to a clean, or sterilised, set of bed linen. At Coventry "the use of an original bathing block has been discontinued, as it was thought that this immediately before leaving the hospital led to colds and infectious discharges from the nose." In the other three instances the patient, after his bath in the ward, proceeds to the discharge block. At Oldham, patients receive a bath in the convalescent ward on the night previous to discharge, and a second bath in the discharge block two hours previous to leaving the hospital; a somewhat similar practice is observed at Croydon and Sittingbourne.

(10) Convalescence Away from Home. (*Hosp. forms: first issue, Sect. B., Qs.* 11 *and* 12; *second issue, Sect. B., Q.* 8.)

It has been noted that in ten instances the printed instructions issued to parents include a recommendation that scarlet fever patients on discharge from hospital should spend their early convalescence, if possible, in the country and away from other children.

From the answers received to Question B. 11 (in the first issue of questionnaires) it is evident that it is the exception rather than the rule for scarlet fever patients to be sent to convalescent homes directly from the hospital. A certain proportion of cases are so disposed in two of the Liverpool hospitals and also at Plaistow; at Bradford, Dr. Kitchen tries to arrange that the patient should spend a week or so in the home of childless relatives; at Blackburn, when scarlet fever is epidemic, patients (after 28 days' treatment in hospital) are accommodated in the smallpox hospital as convalescents.

(11) Instructions given to Parents or Guardians on the Discharge of a Scarlet Fever Patient from Hospital.—(*Hosp. forms: first issue, Sect B., Q.* 12; *second issue, Sect. B., Q.* 8.)

In the case of one-third of the hospitals, it is reported that instructions are given orally to the parent or guardian of children when these latter are being discharged from hospital. In three instances it is mentioned that such instructions are given by the matron or ward sister and twice it is mentioned that the medical superintendent, or the matron, undertakes the duty; for the rest, it is merely reported that instructions are issued by the hospital. At Rhondda the parents are "seen and advised by the medical officer in attendance at the hospital, where retention

of infectivity is considered to be less improbable than usual." The practice at Bromley Isolation Hospital is to inform the patient's own medical attendant when his patient is being discharged, while at St. Helens discharged patients are visited by the health visitor. The medical superintendent of Willesden Hospital states that formerly parents were urged, by printed instructions, to keep the patient separate from other children, etc., but that at present written instructions are not issued. At one hospital both written and oral instructions are given. In the case of those hospitals which do not send out printed instructions (and from which consequently no forms were received) very little information is given concerning the nature of the oral advice proffered to parents.

The personal clothes in which the patient leaves hospital are in the majority of cases disinfected, usually by steam, at the hospital. In some 25 per cent. of the answers, however, there is no evidence that this is so; rather it is stated, or inferred, that clean clothes are brought from home by the parent, and in one report only is it mentioned that the clothes so brought up are disinfected in the home at the time of the patient's removal to hospital. Two reporters note that no personal clothes are brought into hospital, and during the patient's convalescent stage clothes are provided by the institution.

An analysis of the specimen sets of instruction to parents which were sent in by all of the forty or so medical superintendents who issue printed instructions reveals many points of interest. There is considerable variation in the amount of matter set out in these instructions as well as in the manner in which it is set out. The precautions most frequently given refer to the undesirability of the convalescent sharing a bed with another member of the family, of his closely associating himself with other people, or of returning to school until a certain period has elapsed; to the precautions which should be taken when the convalescent develops a discharge from the nose or ear, and to the need for avoiding chill. Other precepts and precautions occur less frequently, and the following may be mentioned: the advantage of being in the open air as much as possible; the desirability of keeping away from all meetings, entertainments, church services, etc.; nightly baths; washing of the hair; rubbing the skin with eucalyptus oil or ointment if peeling is still in process;* use of flannel underclothing; removal of enlarged tonsils; no child visitors to convalescent's house.

In the majority of cases a time limit is set to the period of abstention from school, complete family intercourse, sole occupancy of a bed, and kissing; the most usual limit is 14 days, the shortest time mentioned is 7 days and the longest 28. In a few instances no definite limits are prescribed. As a general rule the instructions are comprehensive, and the instructions

* In both these instances, however, the parent is informed that the peeling skin is not infectious.

issued by Dr. Boobbyer from the Bagthorpe Hospital, Nottingham, may be quoted as an example.

BAGTHORPE HOSPITAL.

SCARLET FEVER.

To Parents, Guardians, and Others.

"Although every care is exercised to prevent the carriage of infection by persons discharged from Bagthorpe Hospital, it is impossible, in some instances, to insure against such an accident, for no one can say with certainty how long scarlet fever may lurk in the system. Parents and others are warned against allowing recently discharged patients to come into unnecessarily intimate contact with others. No person discharged from a fever hospital should be allowed to sleep in the same bed as another until at least a fortnight after discharge. A short holiday in the country (spent as far as possible in the open air, and apart from susceptible children) is desirable after convalescence from scarlet fever. But all persons recovering from scarlet fever should be warmly clothed and otherwise protected against cold. Any recently discharged person who complains of sore throat, nose or ears, or who has a breaking-out on the skin, should be at once isolated, and placed under the care of a medical man. In any case the Corporation cannot accept responsibility or liability for the outbreak of infection occurring among the companions of persons recently discharged from hospital."

It may be mentioned that these instructions, together with those from eleven other sources, appear to have a common inspiration, for, with occasional slight differences, the same points are set out in all and in very much the same language.*

As examples of printed sets of instructions somewhat less comprehensive may be cited the two following :—

(*a*) It is recommended that . . . who has recently recovered from scarlet fever, and who is now fit to be discharged from hospital, should not sleep in the same room with other children until a few days have elapsed.

(*b*) It is recommended that warm clothing should be provided and flannel worn next the skin, and that . . . must not attend school for 14 days after leaving hospital, during which time he or she should, if possible, sleep alone.

Thirty-three out of the forty medical superintendents who enclosed copies of their printed instructions are careful to explain, in these instructions that discharge from hospital carries no insurance that the discharged patient is free from infection ; and

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* Quite by chance, Dr. Boobbyer was the Health Officer of whom further inquiries were made and he kindly replied as follows :—

Dear Dr. Parsons,

I do not know whether credit or discredit, in these changing times, attaches to the authorship of the warning leaflet to the parents and guardians of scarlet fever patients, upon the discharge of the latter from hospital ; but I believe it emanated from my office in the first instance. In the days of the old controversy respecting the hospital isolation of scarlet fever, its pros and cons (especially the cons), a general practitioner alluded to "the cynical effrontery of this leaflet" which I had drawn up "and induced other authorities to accept."

Yours sincerely,

(Signed) P. Boobbyer.

many add that the hospital or local authority cannot accept any responsibility or liability for the outbreak of infection subsequent to the discharge of patients from the hospital. In a few instances it is explained, indeed, that the specific instructions are issued to parents in order that they may co-operate with the health authorities in minimising the chances of spreading infection. Two superintendents demand a receipt for the printed instructions from the person to whom they are given, while in one case the parent is asked to certify that he or she is satisfied both with the treatment that the child has received in the hospital and with its condition on leaving it. In one instance the recipient is asked to keep the list in order to withstand the school-attendance officer, should he call.

E. Scarlet Fever Problems in the Home.

(1) Routine Methods of Home Treatment and Isolation. —(*M.O.H. forms: first issue, Sect. B., Q* 7*; second issue, Sect. B., Q* 6.)

A separate room, and preferably one at the top of the house, is the requirement most usually mentioned in the reports as a whole, both from England and Wales. In country districts this requirement is mentioned twice as frequently as any one other, though the proviso "if possible" is often added. "At the top of the house" can mean nothing more than a bedroom on the upper floor in a large majority of the homes; in one or two instances, however, the parlour is recommended as the sick-room, and occasionally it is a room on the ground floor with access to a garden that is considered essential.

In three instances two rooms are mentioned as essential. The need for "fresh air," "open windows" and "well ventilated rooms" is very commonly mentioned, but there is no evidence of how far such precepts are practised.

Not infrequently it is stated that all superfluous furniture, and especially curtains, mats, and such-like articles, are removed from the sick-room.

The "disinfectant sheet" is still a popular device, especially in the rural districts, and in most cases the use of disinfectants is recommended. In about 150 of the answers to the questions now under review it is mentioned that such disinfectants are supplied by the local authority, but there is evidence from other parts of the report that this figure insufficiently indicates the extent to which disinfectants are so provided by local authorities. The use of separate crockery which is to be kept, washed and disinfected in the sick-room is advocated by most of the reporters. At Pontypridd a scarlet fever card is shown prominently in a ground floor window, while at Blyth a red "S" is marked on the street door.*

The employment of a nurse is mentioned relatively more often

* In Holland, the Burgomaster, on being notified of a case of infectious illness, orders a notice to be posted on the door of the infected house; this notice announces that infectious disease is present and states the name of the disease.

in reports from urban than from country districts, while from Welsh districts it is only mentioned once. In other reports it is insisted that the nursing of the patient should be carried out by one and the same person. The wearing of overalls by the patient's attendant, whoever she may be, is emphasised in 113 of the reports, and in one instance a hood is also advised. The washing of hands in disinfectant solution, and the placing just outside the sick-room of a bucket of disinfectant solution for the reception of soiled articles are frequently mentioned among the precautions.

In urban districts, however, reliance would seem to be placed more on visits of inspection by the sanitary inspector, district nurses or health visitors, as the case may be, rather than on any other expedient.

In Leyton the home-nursing is supervised by a sister from the isolation hospital. On the other hand, in 60 instances it is stated that the supervision of home-treated cases is left to the attendant practitioner; this occurs chiefly in those districts where the medical officer of health is a part-time officer.

In many districts, and possibly in more than appears from the reports, printed instructions are left at houses where scarlet fever patients are being treated. These instructions, while designed for the purpose of guiding parents in the management of home-treated cases, are also used by inspectors as criteria when calling to see if satisfactory arrangements have been made for the care of the patient and for preventing, as far as possible, the spread of the disease. Specimen sets of instructions were received from forty districts, and these may be divided into two groups: (i) those which contain "General instructions for preventing the spread of infectious diseases," and (ii) those relating particularly to the "Home-isolation of patients suffering from scarlet fever." There is much variation in the get-up of these printed instructions, and it may be said of the majority that they contain a considerable amount of matter for the householder to peruse. The pamphlets in the first group aim primarily at showing the parent or guardian where he or she can, and must, assist in preventing the spread of infectious diseases. For this purpose many of them contain information about such infectious diseases as are notifiable, their signs, periods of infectivity, etc.; instructions concerning what should be done when the occurrence of a case of infectious disease is suspected and concerning the procedure to be followed in the house both in the case of patients removed to hospital and of those who are to be nursed at home; the majority of pamphlets also explain and impress upon the householder his legal responsibilities where infectious diseases are concerned, and point out the penalties that may be enforced where there is failure to comply with the law.*

* In the Bristol pamphlet the responsibilities and penalties are set out clearly with the following marginal references: Failure to notify; Disinfection; Exposure of infected persons or things; Letting of infected houses or rooms; Ceasing to occupy infected rooms; Infectious rubbish; Retention of infectious body in living room.

In a considerable number of pamphlets relating to scarlet fever attention is drawn to the importance of mild cases as agents in the spread of infection, and in many cases also an explanation is given of the principles underlying the instructions. These instructions are very similar (and as a general rule very complete) in all the specimens submitted, and include several points that are not mentioned in the questionnaire answers. As with the pamphlets as a whole, there is infinite variety in the way in which the special scarlet fever instructions are drawn up and set out in the printed booklets, slips or cards ; in a few instances it is conspicuously stated that the instruction slip, card, etc., must be burned at the termination of the case. Not uncommonly the instructions for home-treatment are prefaced by the advice that isolation and treatment in hospital is the preferable method of dealing with cases of scarlet fever, but this is not to say that in all cases there is not an evident desire to help the householder by providing him with the fullest information.

In pamphlets used at York the information is divided into two portions, that concerning the help which will be rendered by the Health Department and that concerning the part which the householder is expected to play. In other pamphlets such as that issued by the Dewsbury Council the instructions are arranged under headings concerned with (i) the sick-room, (ii) the patient, (iii) the attendant and (iv) general. This classification may be used here in considering those instructions which appear in the great majority of the slips.

(i) *The sick-room.* As in the questionnaire answers the need for a separate room is the first condition laid down. From such a room it is again recommended, by many, that carpets, curtains, cushions, mats, clothes and all superfluous articles should be removed. The need for ventilation is mentioned in most cases, and the advantage of a fire for purposes of ventilation and the destruction of infected material is also explained. The use of a sheet wrung out in disinfectant and hung across the sick-room door is mentioned several times. By one author it is stated : " But it must be remembered that this device will not prevent spread of infection if the general precautions here given are not faithfully carried out." In another set of instructions, however, it is stated that " the effect of this (a sheet kept constantly wet with disinfectant) will be to keep every other part of the house free from infection."

Periodical sweeping and scrubbing of the sick-room floor, followed by the use of disinfectants, is advocated by some, and three authors refer to the importance of burning these sweepings in the bedroom fire and not removing them to other parts of the house. In one set of instructions householders are advised that the spraying of floors and the exposure of disinfectants in saucers, etc., achieve no good.

Not mentioned often in the questionnaire answers, but receiving considerable attention in these printed instructions, is

the warning about destroying fragments of food handled and left by the patient.

Instructions about the immediate reception and disinfection of bed linen, personal clothes and other soiled fabrics in a pail of disinfectant (kept in the room) appear in most of the pamphlets, and stress is also laid on the importance of reserving, and periodically cleansing, a set of food utensils for the sole use of the patient.

Not uncommonly, attention is drawn to the fact that most disinfectants are poisonous ; such disinfectants are rarely mentioned by name.

As regards the final disinfection of the room and the patient's bedding, the householder in most instances is advised that this will be carried out by the local health authorities when they are informed of the removal of a patient to hospital or his release from home isolation. In a fewer number of instances specific instructions are laid down for the householder to carry out this terminal disinfection himself.

(ii) *The patient.* Not unnaturally, there are fewer references to the clinical care of the home-treated patient than to the other circumstances of the case. Advice and instructions concerning the period of convalescence and on recovery of the patient are given, however, in most pamphlets, and these closely resemble those instructions issued to parents by hospital authorities on the discharge of children from hospital.

Inunction of the patient's body during the stage of desquamation is recommended in some of the pamphlets, including those few in which it is stated that the scales are highly infectious.

The instructions issued by the Horwich Urban District Council are set out on a card headed "Prevention of the spread of scarlet fever without hospital isolation as advocated by Dr. Robert Milne." In this case inunction is limited to the first 10 days of the illness and involves the whole body.

A final disinfecting bath is mentioned in most pamphlets. As a rule there are instructions about school attendance both on the part of convalescents and contacts, and the necessity for obtaining a certificate from the attendant practitioner when he considers the patient free from infection. The possibility of death is allowed for in some of the pamphlets, and parents are reminded of the regulations regarding the proper disposal of the body and its burial within 48 hours of death. Unnecessary viewing of the body is discouraged, and in one north-country town wakes are expressly forbidden.

(iii) *The nursing attendant.* The desirability of only one member of the household undertaking the duties of nursing is pointed out in most of the pamphlets, and—as a counsel of perfection, perhaps—it is further suggested that the nursing attendant should confine herself as far as possible to the care of the patient. The use of some kind of washable overall by the nurse is again strongly recommended, and once or twice the wearing of caps to confine the attendant's hair is suggested. There is some differ-

ence of opinion about where these overalls should be kept; sometimes it is the sick-room that is recommended and sometimes it is the landing or passage outside the sick-room. By three of the Councils (Wantage U.D.C., Wantage R.D.C. and Faringdon R.D.C.) in Dr. Sisam's West Berks Combined District, washable overalls are provided for the use of attendants on patients. Among other rules of conduct for nurses frequently mentioned are the washing and disinfecting of hands and the taking of meals outside the sick-room.

(iv) *General instructions.* There are very few of the pamphlets which do not emphasise the importance of restricting to a minimum the number of persons who are allowed to have access to the patient; visitors to the house, it is also stated, should be discouraged. Two or three reporters state that no one but the parents are allowed to remain in the house. A few of the pamphlets advise the rigid exclusion of dogs and cats from the sick-room. The substitution of clean rags or even paper for the ordinary handkerchiefs, towels, etc., and the immediate burning of the former after use, is a point in sick-room ritual which is more generally mentioned than any other.

Seldom omitted also is a warning against sending soiled linen to a public laundry unless it is stated at the same time that such articles come from an infected patient or house. Rather, it is urged, should soiled linen and garments be washed at home. In Brighton much is left for the individual householder to accomplish for herself both in the matter of dealing with soiled linen and in the disinfection of the house generally. The printed "Instructions as to cleansing and disinfection after scarlet fever and diphtheria," issued by Dr. Forbes in 1924, are reproduced in the footnote below.*

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* As the infection comes chiefly from the throat and nose the following measures must be taken immediately after the removal of the patient.

(1) All bedclothes and particularly sheets, pillow-slips, and handkerchiefs which are in contact with the nose and mouth must be put into water at once and washed† linen and cotton goods being brought to the boil in soapy water. The above applies equally to the attendant's clothes.

(2) All feeding and drinking utensils used by the patient must be kept apart and be placed in boiling water for five minutes and then be thoroughly rinsed and cleansed.

(3) All pens, pencils, toys and books used by the patient whilst ill are best burnt if of little value. On the other hand, if the parents prefer it (*a*) pens and pencils can be put in boiling water for a few minutes; (*b*) many toys can be boiled or thoroughly washed. Books are difficult to disinfect, so if of value, or if they belong to a library, the parents should have them called for from this office.

The rooms used by the patient must be spring-cleaned.

If the above instructions are carefully attended to there is no need to spray or fumigate the bedroom or to move bedding for steam disinfection; such spraying and stoving will only be undertaken if the cost is paid in advance. When the inspector calls to see that cleansing has been thoroughly carried out he will be pleased to advise on any doubtful point.

† To send goods which have been exposed to infection to a laundry, except notice is given that they have been exposed to infection and except proper precautions are taken in transmission, renders the sender liable to prosecution.

Attention is drawn in many pamphlets to the impropriety of infected households borrowing books from a public library, and as regards other books, toys, etc., handled by the patient it is explained that these should either be destroyed at the end of the illness or handed over to the health authorities for disinfection. In a few instances there is a warning against the writing of postal matter in the sick-room.

Finally, a notable, but comparatively uncommon, request is that parents should note—and report to their doctor—the occurrence of any cases of sore throat or suspicious illness occurring in their households.

(2) Special Methods of Home Treatment.—(*M.O.H. forms : first issue, Sect. B., Q.* 8 *and* 9; *second issue, Sect. B., Qs.* 7 *and* 8; *also special reports, printed pamphlets and correspondence.*)

To the question "Has any special form of home treatment been tried either as a deliberate policy through lack of hospital accommodation, or for other reasons," the great majority of reporters answered "No." There are just over 100 answers, however, in which mention is made of special forms of treatment; and, with two or three exceptions, the form of treatment mentioned in all these answers has to do with some method of inunction. In Appendix M will be found tabulated all the references to the use of inunction methods which it has been possible to collect, and references Nos. 36 to 143 of this table embody answers to the particular question now under consideration. The inunction methods mentioned in the questionnaires fall into two main groups; those that are employed early in, or throughout, the illness as a pure or modified form of Milne treatment, and those that are only used during the later stages of desquamation in order to hasten this process or to prevent the dissemination of scales. Of the 103 instances of the use of inunction methods in the home treatment of scarlet fever, 82 (as far as can be judged) all into the first group and 21 into the second.

The English districts concerned (see Map A) are, as a general rule, small urban districts comprised in 28 administrative counties, of which Cheshire, Lancashire, Middlesex and Yorkshire figure most prominently.

In Wales, where hospital facilities are more frequently lacking, inunction methods are used in a relatively larger proportion of districts (10).

In London, the boroughs of Westminster and Lambeth are the only ones in which it is recorded that the Milne methods have on occasion been adopted.

As regards the methods of treatment included in the first group, it is doubtful, from the description given, whether many of these are in strict conformity with the methods practised by Dr. Milne. Twenty-six reporters certainly describe their methods as "the Milne method" or "modified Milne method"; others probably mean a modified Milne method in such descriptions as "inunction with eucalyptus oil, painting fauces with carbolised oil";

MAP A.

Shows those sanitary districts in which some form of the Milne treatment has been, or is being, adopted.

X = *Districts in which, as far as can be judged such treatment is at present a routine practice, or is approved and adopted on occasion.*

o = *Districts in which such treatment was once adopted but has now been discontinued, either because of its failure or because the reasons for its trial no longer exist.*



County Boundaries, ——

Scale of Miles.

0 25 50 75 100

368.W.1127.4.3046/722

Malby & Sons, Lith.

"patients rubbed all over with eucalyptus oil"; "early and continuous inunction"; "eucalyptus treatment"; "patient rubbed from head to toe in carbolic or eucalyptus oil daily," etc., etc.

In very many instances, however, and including those where the treatment is described as the "Milne method," strict isolation is also mentioned as part of the treatment, though this safeguard was thought by Milne to be unnecessary. An exception is furnished by Dr. J. S. Pickford, Medical Officer of Health, Little Lever, Lancs., who writes: "Since we adopted Dr. Milne's method of eucalyptus treatment (begun November, 1914) we have not found it necessary to isolate home-treated patients." Then, there is seldom any mention of the frequent applications of carbolic oil to the throat which formed an important part of the strict Milne ritual. It is not unusual, however, for the inunction of the body to extend beyond the time-limit laid down by Milne. It seems safe to conclude moreover that the scant reference to special nursing implies that such service is not generally employed or even available.

The importance of good nursing, however, is realised and noted in some of the answers. Thus: "Satisfactory if carried out thoroughly by nurse trained in treatment" (Dr. A. Falconer, Earby); "Cannot be relied upon except when a trained nurse is employed" (Dr. A. T. Johns, Banbury); "Every satisfaction when applied by a skilled nurse" (Dr. C. T. Scott, Market Harborough). On the other hand, Dr. Pemberton (Buckingham) considers that the external application of eucalyptus all over the body can be easily carried out by anyone who has been properly instructed.

In most of the answers there is no very clear evidence as to the number of cases that have, in fact, been home-treated on Milne lines even where, as in some answers, the period for which this treatment has been tried is stated. Treatment at home rather than in hospital is the rule in most of the districts where Milne methods are employed, but in many of these districts the statistical returns show that the totals of cases notified are comparatively small, and therefore of limited value.

From a few districts, however, more precise information is available, and this information in some instances refers to an appreciable number of cases. The following districts are notable in one, or both, of these respects.*

TOTTENHAM.—Here the treatment was started by Dr. D. Kirkhope on April 3rd, 1922, and up to the end of 1923 there were 924 cases

* It should, perhaps, be explained that, with the exception of Southgate the remarks here refer only to those instances where, according to the present inquiry, inunction methods are used—or have been used—in the *home-treatment* of scarlet fever patients. In Appendix M will be found further information about the experience of inunction methods in hospitals and institutions, and also in a few districts whose health officers have not on the present occasion reiterated or supplemented previous communications on the subject.

in which the treatment was carried to a conclusion. The recent trend towards home-treatment generally in Tottenham is seen in the table below.

TABLE 40.

TOTTENHAM: *Shows the increase in numbers of* SCARLET FEVER CASES TREATED AT HOME.

Year.	Total no. of notifications.	No. sent to hospital.	Percentage.	No. treated at home.	Percentage.
1917	183	150	81·9	33	18·1
1918	222	176	79·2	46	20·8
1919	483	343	71·0	140	29·0
1920	596	409	68·6	187	31·4
1921	1062	500	47·0	562	53·0
1922	919	212	23·0	707	77·0
1923	385	36	9·3	349	90·7
1924	367	67	18·2	300	81·8
1925	427	68	15·9	359	84·1

SOUTHGATE.—Dr. A. S. Ransome started to treat his hospital patients on Milne lines in May, 1922, and by December, 1923, 100 patients had been so treated; Dr. Ransome writes on October 13, 1925, that he is still using the same method of treatment.

WEALDSTONE.—Dr. R. P. Bluett, as Medical Officer of Health, has carried out a modified Milne treatment since October 1922, and 101 cases have been treated on these lines during the period January, 1921 to April, 1923. The practice at Wealdstone dates back to 1912.

CHISWICK.—During an epidemic in 1914, Dr. R. Craske Leaning reports, 75 cases were treated on Milne lines in the Chiswick Urban District. Normally, however, the majority of cases in this district are treated in hospital.

HESTON AND ISLEWORTH.—Owing to temporary lack of hospital accommodation Dr. E. H. T. Nash, during the autumn of 1922, arranged for the treatment of 10 cases in Isleworth by the Milne method. Usually the great majority of cases in this district are treated in hospital.

CASTLEFORD.—Since November, 1922, to the end of 1923, and on the recommendation of Dr. W. Kemp, 64 cases of scarlet fever have been treated in the Castleford Urban District by the Milne method.

Among other districts in which it appears probable, from the present reports, that some form of Milne treatment has been used in a considerable number of home-treated cases are:

Abertillery U.D.; Audenshaw U.D.; Brownhills U.D.; Caxton and Arrington R.D.; Colne B.; Denton U.D.; Horwich U.D.; Little Lever U.D.; Market Harborough U.D.: Morpeth R.D.; Middleton B.: Okehampton U. and R.Ds.; Standish-with-Langtree U.D.

The occasion for adopting some form of Milne treatment is mentioned in only a few of the answers, but lack of hospital

facilities, and particularly in Wales, would seem to be the most usual reason for trying the Milne method as a form of home-treatment. This reason is advanced by the Medical Officers of Chiswick, Heston, Keighley and Tottenham. On the other hand, at Wealdstone and Castleford the method was inaugurated as an independent policy while at Tottenham it has been continued as a routine practice and on a larger scale than is the case elsewhere.

Referring again to Appendix M., Nos. 36 to 143, it will be seen that in some 30 answers there is no mention of the results following the adoption of Milne methods in home-treated patients ; the districts from which information on this point was included in the questionnaire answers are set out below according to their verdicts.

Results "satisfactory," "good," "excellent" etc.	Lambeth; Westminster; Buckingham U. and R.D.; Honiton U.D.; Plympton St. Mary R.D. ; Poole R.D. ; Whickham U.D. ; Sheppey R.D. ; Billinge U.D. ; Denton U.D.; Horwich U.D.; Little Lever U.D.; Middleton U.D. ; Oswaldtwistle U.D. ; Standish with Langtree U.D. ; Horncastle U. and R. D. ; Chiswick U.D. ; Harrow-on-the-Hill U.D. ; Southgate U.D. ; Tottenham U.D. ; Wealdstone U.D. ; Morpeth R.D. ; Hucknall U.D. ; Kidsgrove U.D. ; Newmarket U.D. ; Kirklington-cum-Upsland U.D. ; Castleford U.D. ; Drighlington and Gildersome U.D. ; Springhead U.D. ; Thorne R.D. ; Burry Port U.D. ; Colwyn Bay and Colwyn U.D. ; Dolgelly U. and R.D. ; Prestatyn U.D. ; Hay R.D.
Satisfactory "where orders are obeyed," "treatment is thorough," or "where good nursing is available," etc.	Northleach R.D. ; Audenshaw U.D. ; Market Harborough U.D. ; Banbury U.D. ; Brownhills U.D. ; Tamworth U. and R.D. ; Burnham-on-Sea U.D. ; Earby U.D.
Results "inconclusive" or "doubtful."	Winsford U.D. ; Swindon and Pendlebury U.D. ; Whitchurch R.D. (Hants) ; Spilsby R.D. ; Twickenham U.D. ; Oundle U.D. ; Darton U.D. ; Wombwell U.D. ; Bacup U.D.
"No advantage," "no obvious result," "no guarantee against secondary cases."	Okehampton U. and R.D. ; Gateshead C.B. ; Isle of Axholme R.D. ; Ipswich C.B. ; Woodbridge R.D. ; Nuneaton M.B. ; Wigton U.D. ; Beckenham U.D.
Results unfavourable.	Macclesfield R.D. ; Northfleet U.D.

The particular benefits that have followed the adoption of Milne methods are seldom mentioned, but two or three reporters state that the spread of infection is prevented and Dr. Craske Leaning comments on the absence of return cases when the treatment was tried in Chiswick during 1914. On the other hand, the statistics furnished by Tottenham show an unusually high return case-rate during the time that Milne methods have been practised in that district. Dr. Kirkhope reports (1924) that "so far as the patients

are concerned the results (at Tottenham) are satisfactory," but he adds, " the question is whether secondary cases are more frequent or whether they are brought to light by the constant visitation of the houses and oversight of the contacts.*" Some warrant for this hypothesis is supplied by the fact that the return case-rate for hospital-treated cases in Tottenham is also high, though not so high as that recorded for the home-treated cases.

TABLE 41.

Tottenham: Shows RETURN CASE-RATE IN HOSPITAL AND HOME-TREATED CASES *since the Milne Treatment was started; no previous records are available.*

Year	No. of notified cases.	Percentage of cases sent to hospital.	Return case rate.	Percentage of cases treated at home.	Recovery-case rate.†
1922	919	23·0	6·1	77·0	8·2
1923	385	9·3	8·3	90·7	9·4
1924	367	18·2		81·8	8·7
1925	427	15·9		84·1	11·7

Dr. Ransome's experience as regards return cases is similar. Comparing the results of his first series of 100 Milne-treated patients with those of 100 previous cases treated on ordinary lines, he found that the return-case rate in the Milne patients was 5 per cent. as against 3 per cent. in the other patients. In other respects, as shown in the following table, the Milne results are comparatively very favourable.

* In his 1925 report, Dr. Kirkhope states that " the Council has quite definitely adopted the home-treatment of Scarlet Fever as their policy, except in instances where that is precluded for cogent reasons." He states in a previous paragraph, however, that " the menace attaching to the retention of scarlet patients in their own homes is the occurrence of secondary cases—one that must be admitted."

† By a " recovery case " is meant a secondary case occurring in a house within 28 days of the release from isolation of another member (" primary case ") of the household who has been treated at home.

TABLE 41A.

Southgate: Results of 100 CASES TREATED IN HOSPITAL BY MILNE METHODS *compared with results of* 100 *other cases treated in hospital by ordinary methods.*

100 Cases Scarlet Fever.	Average day of disease on which temperature became normal.	Average day of disease for getting up.	Average percentage of cases of Adenitis.	Average percentage of cases of Nephritis.	Average percentage of cases of Otorrhœa.	Average percentage of other miscellaneous complications.	Average number of days in hospital.	Average percentage of return cases.
Ordinary Treatment	5th	22nd	26%	4%	4%	5%	38·5	3%
Milne Treatment ..	3-6th	14th	20%	1%	1%	1%	26	5%

The following comments by Dr. Ransome on the results so far recorded about the trial of Milne methods at Southgate are extracted from his Annual Report for 1923 :—

"One hundred cases is a small number on which to base very decided conclusions ; but as far as they go, the analyses of these two periods of treatment certainly point in favour of the 'Milne' method all along the line, except in the matter of 'return' cases, upon which, however, too much stress should not be laid, as the circumstances of many so called 'return' cases often admit of other explanations of them. *The one great advantage*, apart from the diminished occurrence of complications, of the 'Milne' method, both from the administrative and the patient's point of view, *is the greatly shortened average stay in hospital*, which means, on the one hand, less expense to the community in isolating these cases and the ability to serve a larger population with the same number of beds than by the ordinary treatment, and on the other hand, that the patient is enabled sooner to return to school or work. One of the reasons of the shortened average stay in hospital is, I think, that desquamation is accelerated. The only disadvantage appears, perhaps, to be a slightly increased risk of 'return' cases.

"On the whole the results appear to be encouraging and justify the continuance of the method for a further period."*

Apart from the 82 districts discussed above, in which Milne methods—more or less modified—have been practised or recommended in the case of home-treated patients, there are some 20 districts where inunction with eucalyptus or carbolic oil is

* In connection with Milne methods as applied to *hospital* practice, the following extract from a recent letter by Dr. Foord Caiger may be quoted. "A prolonged and critical investigation of the treatment and its results, which I made some years ago in company with Dr. Milne at his own hospital, completely dispelled any belief I previously held as to the possible value which might attach to the method in hospital practice."

recommended in the late stages of the disease to prevent the dissemination of scales. In many of these districts the practice is advised in the printed instructions issued to parents.

There is little information given about the staff employed, or considered necessary, to carry out or supervise the various forms of inunction treatment. At Tottenham, Dr. Kirkhope finds that one specially trained nurse to every five or six patients is necessary; at Wealdstone, and in the few other places where a special staff for carrying out Milne treatment is mentioned, one special nurse is usually employed.

From most of the answers to Question 8, however, it appears that, in normal times, no special nursing service is employed other than that usually provided by the Health Department concerned. The most noteworthy information concerning the use of nurses for home-visiting in times of special stress comes from Bristol. In this city nurses were specially employed in 1921 to deal first with an epidemic of measles and then with an outbreak of diphtheria; the measure proved so successful in the case of these two diseases that scarlet fever was included among the diseases to be dealt with in this way. Dr. Davies speaks of this development of Home Nursing Service as "the only improvement of prime importance in basic Public Health work that it has been possible to secure since the War."*

Dr. Jones, Newport, also considers that home-nursing is valuable at times; he writes: "When scarlet fever has been epidemic and hospitals are insufficient to meet all needs, special nurses have been appointed to visit home-nursed cases, to carry out the medical attendant's instructions, to attend the patient, and show the mother what to do and how to do it. The results, in my opinion, have been excellent and most valuable from an educational standpoint as well as in preventing complications and thus keeping down mortality."

At Worksop in 1914 the Council appointed one qualified nurse whose duties were to "visit notified cases in their homes, assist mothers in carrying out treatment and make inquiries for contacts and missed cases." Similarly at Hinckley in 1911 two nurses were appointed for duty in an epidemic comprising 429 cases. In Scunthorpe "fever nursing" was started in 1923, and in this district (population 27,790) one nurse is found sufficient. In Accrington, during 1921, four health visitors were detailed to visit homes in which scarlet fever had appeared to give advice on nursing. In Nuneaton "home-nursing and home-visiting is carried out by the isolation hospital staff, no additional staff being necessary for the nursing of scarlet fever." In Leyton, also, inspection of home-nursing methods is carried out by a sister from the isolation hospital. There is a "small panel of handy women" employed at Smethwick to help in home-treated cases, while in two districts it is mentioned that a "handy-man"

* Ann. Report of Medical Officer of Health, Bristol, 1922.

is employed by the health authority to do the housewife's shopping when she is nursing a case of scarlet fever.

In the Salisbury Rural District it is mentioned that on one occasion a widower was taken from his usual work and paid to act as nurse to his child.

(3) Home-visiting of Scarlet Fever Convalescents.—(*M.O.H. forms: second issue, Sect. B., Q.* 4.)

The object of Question 4 was to determine whether it was a general practice to keep in touch with scarlet fever patients discharged from hospital or released from home-isolation who might, through lack of proper after-care or other causes, become responsible for return cases among other susceptible children of the household. In respect of urban districts it was stated by 244 reporters that they make a practice of following-up scarlet fever convalescents in homes where susceptible children are living, while 290 reporters state that they do not; in the country districts the numbers are in much the same proportion. It is at least doubtful, however, whether in all the affirmative answers the intention of the question was quite understood; thus in a certain number of districts the "following-up" refers rather to visits made to the house during the actual illness at home of one of its members. By some reporters again "following-up" means an examination of the patient a fortnight after his discharge from hospital, or release from home-isolation, and preparatory to his return to school. A certain number of the reporters qualify their positive answers by the words "as far as possible." Two reporters state that such following-up would not be tolerated by the attendant practitioner, while in another district it is stated that "such supervision would be looked upon as a criticism by the hospital authorities." At Ilkeston "since the appointment of a whole-time medical officer of health it has been the practice." A few reporters, while answering the question in the negative, state that before discharging a patient from the hospital they always give special consideration to the conditions in his home.

At Ebbw Vale following-up is only practised "when co-operation with school clinics is desired," but in a few other reports it is stated that the supervision of convalescents is carried out at the school clinics. At Batley, also, cases are followed-up "through reports of health visitors and school nurses." At Smethwick, the hospital authorities not only inform the Medical Officer of Health each week of impending discharges, but acquaint him also with the names of those patients who, while under detention, suffered from any complication of the ear, nose, or throat; such convalescents are followed-up by school nurses. Dr. Garrett (Cheltenham), on the other hand, does not consider that "any good results obtained (by following-up) would make it worth while."

(4) Disinfection.—(*M.O.H. forms: first issue, Sect. B., Qs.* 12, 13 *and* 14; *second issue, Sect. B., Qs.* 11, 12 *and* 13.)

The subject of disinfection generally received considerable attention and information regarding (a) *the various disinfecting measures* which are currently practised was received from some 850 districts. It will be convenient to analyse the answers concerning these measures according to the various sub-divisions of the question.

(i) *Disinfection of Mattresses, Palliasses and Bolsters.*—In urban districts the most usual method, by far, is steam disinfection, and this method, either alone or combined with some other device, is adopted in all the Metropolitan Boroughs from which returns were received. In rural districts fumigation displaces steaming as the most prevalent practice as shown in the table below.

Table 42.

Disinfection of Bedding.

	Towns.	Country districts.
Most common method.	Steaming in 336 towns.	Fumigation 108 districts.
Next most common method.	Fumigation in 144 „	Steaming in 83 „

Steam disinfection is carried out most frequently at the isolation hospital to which the patient is sent; or, in larger places, the articles may be dealt with at a separate disinfecting station. In Leeds, saturated steam (15 lbs. pressure) at a temperature of 245°–260° F. is used. In three Essex districts steaming takes place in the home by means of a portable steam disinfector. Before the war Dr. Messiter, Medical Officer of Health for the Isle of Axholme Rural District, also used a portable steam disinfector of his own invention (87).

In Coventry, Frome, Cheltenham, and in the Scunthorpe and Frodingham Urban Districts, the steam is cheaply obtained from a laundry, from a refuse destructor, from a neighbouring boiler, and from the local gas works respectively. The lack of facilities explains no doubt why fumigation is more commonly practised in country districts. In the fumigation of bedding formaldehyde is used more often than sulphur, but in three districts both substances are used at the same operation. Various qualifying conditions for steaming the bedding or patients' clothes are mentioned by a few reporters. Thus in thirteen districts it is the practice to use steaming only in the case of patients treated at home; in Tottenham and in Whickham Urban District, on the contrary, steaming of bed linen and personal clothes is employed when the patients are sent to hospital, while the same articles are sprayed

in the case of children treated at home. Occasionally it is stated that steam disinfection is reserved for severe or septic cases. There are single references to the unsuitability of steaming when clothes have not recently been worn, when they are not valuable, and when mattresses have leather tabs. In two or three reports it is stated that steam disinfection is carried out if the householder is willing to incur the cost of such disinfection, but in most instances steam disinfection, like other methods, is presumably carried out at public expense. Spraying suffices in a comparatively small number of districts, and in a rather larger number of places it is combined with fumigation; occasionally it is used also with steaming; washing in disinfectant is also mentioned. In forty districts the bedding is occasionally destroyed; this is done owing to the dirty or verminous condition of the articles, or because—as in some parts of Northumberland and even Middlesex—the mattresses and bolsters are filled with chaff, or other cheap material. In other instances the stuffing is destroyed and the covers disinfected by boiling or steaming. Baking or stoving is mentioned as an alternative to steaming in a few places, and is apparently carried out also at the hospital.

(ii) *Disinfection of Bedclothes and Personal Garments.*—Both this and the first part of the question are often included in one and the same answer. Steam disinfection is again the process most commonly mentioned both as regards urban and rural districts and almost exclusively in the case of the Metropolitan Boroughs. In a considerable number of districts (142) fumigation also seems to be used for the disinfection of sheets and personal garments; while spraying alone, or combined with some other method, such as fumigation, has also a few adherents. Boiling, washing and steeping in disinfectants are methods which are more commonly used; baking and burning are not frequently mentioned in connection with personal garments and bedclothes. Ventilation alone suffices in five districts.

(iii) *Disinfection of the Furniture.*—Fumigation, most frequently with formaldehyde, and spraying are the two methods most commonly used in both town and country districts; in the Metropolitan Boroughs spraying is chiefly done. The various articles that have been left in the room are treated *in situ*, and many reporters remark that these operations create an excellent opportunity for a general spring-cleaning and thorough ventilation of the sick-room. Washing with, or without, some disinfectant is the next most common method, and one that seems to be specially favoured in country districts.

(iv) *Disinfection of Toys, Books, etc.*—In the great majority of districts toys are burnt or otherwise destroyed after being used by the sick child; less frequently books meet the same fate. In a very few districts it is the custom to fumigate or spray books and toys before burning them. Next to destruction, the most usual way of dealing with toys and books is by means of fumigation; this procedure, together with spraying or washing

with disinfectant, are the methods used in disinfecting the more valuable articles. One reporter mentions that books to be fumigated are hung on a line, edges downwards, so that the fumes can easily penetrate between the leaves. In a few instances both books and toys are sent to the hospital for disinfection and subsequent retention by the hospital authorities; books belonging to a public library, it is sometimes stated, are also sent to the hospital for disinfection before return; it is mentioned that at Bognor compensation is given where library books are destroyed.

(v) *Disinfection of Utensils.*—Scalding is carried out in 318 districts (approx.), washing in disinfectant in 250 (approx.), and steaming in 20 (approx.). Fumigation is frequently mentioned, and presumably the food and drink utensils are considered to be so treated when the room and its contents are fumigated. Spraying is said to be the process used in 10 rural and in 9 urban districts. In 16 districts no special disinfection of utensils is carried out.

(vi) *Disinfection of the Sick-room.*—Many are the methods, or combinations of methods, employed in the disinfection of the sick-room itself, but in a very large majority of districts fumigation is evidently the most popular method. It is employed alone in a large number of instances, and equally often it appears to be reinforced by other measures, while frequently it is mentioned as an alternative to spraying. Formaldehyde is used far more often than sulphur dioxide; in two or three instances it is stated that the room is fumigated with both these substances. Seldom are any details of the fumigation process given in the answers, but the periods for which the room remains sealed vary between 3 hours and 2 days, the most usual period being 24 hours.

It is frequently stated that the fumigation of the various articles in the sick-room takes place when the room is being filled with vapour of formaldehyde or sulphur; and presumably where no such statement is made, the fumigation of bedding, furniture and other objects (mentioned under preceding paragraphs) occurs as part of the process of sick-room fumigation. Spraying of walls, ceiling and floor of the sick-room with solution of formalin or occasionally with other disinfectant is, after fumigation, the most commonly mentioned method for dealing with the sick-room. This method is almost inevitably followed by a general spring-cleaning of the room, which sometimes includes stripping the walls, repapering them and whitewashing the ceiling. Amongst the places where notices to strip walls and thoroughly cleanse rooms are served* may be mentioned Chiswick, Edmonton, Enfield and Friern Barnet (see page 138). Evidently, in not a few districts, it is a general clean-up and thorough ventilation that is aimed at, and to achieve such results the method of spraying seems well suited. Sealing the room when spraying is done seems to be a not uncommon practice. In Stoke-on-Trent

* In virtue of Sect 5, Infectious Diseases (Prevention) Act, 1890.

the poorer tenants are encouraged to limewash their rooms, and the Council supplies brushes and lime for the purpose.

There are no districts in which it is reported that no action of any kind is taken with regard to the disinfection of the sick-room.

(vii) *Disinfection of Other Parts of the House.*—It is the exception rather than the rule for other parts of the house, such as the hall, w.c., bathroom, to be disinfected. Many say that the question is treated on its merits, or that disinfection is only done "in certain circumstances." Where action is taken it is usually on the same lines as those followed in the sick-room itself, and consists of washing or spraying with disinfectants, and fumigation. In very few instances is the practice specifically referred to the scheduled "other parts of the house." In two West Riding urban districts and at Rhyl the whole house is disinfected.

In Appendix N. are enumerated all those districts in which the reported practice of disinfection differs in one or more particulars from that carried out in the great majority of districts. It will be seen at once that the list is comparatively a very short one, and that fourteen of the districts are only included because, in them, no definite disinfection of food utensils is carried out. The previous analysis has shown, indeed, that, despite an infinite variety in the methods of terminal disinfection, which are said to be practised in the various districts, there would seem to be extremely few instances where any fundamental changes in traditional methods have been made. These instances are extracted from the larger list and grouped below for convenience. First, as Brighton is the borough where disinfection has received special attention, it has been thought well to reproduce exactly Dr. Forbes' answers to Question 11 :—

(*a*) Mattresses, palliasses, bolsters, etc.
Nothing done.

(*b*) The bedclothes and personal garments of patient.
Sheets and pillow cases boiled and laundered at home and blankets washed by the occupier. Personal garments also laundered at home. Nothing else done.

(*c*) The furniture of the room.
See (*f*)

(*d*) Toys, books, etc., used by patient.
Toys destroyed, books burnt.

(*e*) Food and drink utensils used by patient.
Are placed in boiling water for 5 minutes.

(*f*) The sick-room itself.
Spring-cleaned by occupier. Walls wiped down with a damp cloth or broom. The floors are washed.

(*g*) Other parts of the house (hall, bathroom, W.C., etc.)
Hall, nothing done. Bathroom and W.C. cleansed by occupier.

Note by Dr. Forbes :—

"In cases occurring in schools, public institutions, hotels, boarding houses and families of milk-sellers, school teachers and Post Office officials, the whole of the bedding, etc., is disinfected by steam and the walls and floor of the room sprayed with disinfectant."

It will be observed that, as far as private houses are concerned, nothing is done, or recommended to be done, in the case of the bedding; and that, where measures of disinfection (in private houses) are recommended, the duty of carrying them out is placed upon the householder. Next, are cited those districts where, in some particular, the practice of disinfection is out of the ordinary.

TOTTENHAM U.D.—Nothing done in the case of home-treated patients.
WALLASEY C.B.—Nothing done to the room, the furniture nor the utensils.
MANCHESTER C.B.—Sick-room washed with chloride of lime, paper stripped.
BATLEY U.D.—Sick-room spring-cleaned only.
CHATHAM B. " " " "
GILLINGHAM B. " " " "
HALIFAX C.B. " " " "
LEICESTER C.B.—Utensils washed; everything else sprayed only.
EALING U.D.—Bedding, bedclothes and personal garments steamed; nothing done in other respects.
NEW RADNOR R.D. } Beating, washing and exposure to sun and
ABERYSTWYTH R.D. } wind of bedding, bedclothes and garments.
SUTTON U.D.—Nothing done to books.

Finally, in the districts shown below, while fumigation of the room is said to take place, it is also stated that nothing is done, or that no special methods are employed, in the case of bedding, bedclothes and personal garments. (In most cases the statement holds good with regard to all three kinds of articles; in others it applies to the bedding only):—

Bedford U.D.; Lostwithiel R.D.: Arlecdon U.D.: Hartlepool U.D.; Lees U.D.; Leigh U.D.; Spalding U.D.; Aylsham R.D.; Blofield R.D.; Huthwaite U.D.; Martley R.D.; Kirklington-cum-Upsland U.D.; Bedwas and Machen U.D.; and Ulverston C.D.

(b) *The Chemical Disinfectants Used.*—As frequently mentioned above, formaldehyde is the substance most used for fumigation; it is mentioned occasionally that a lamp, "formaquettes," tablets, etc., are used for the purpose, but as a rule no details regarding the technique are given. Nor are there any such details given in the case of sulphur beyond a few allusions to the use of sulphur candles.

For spraying, formalin (40 per cent.) seems to be most used, but occasionally Izal and other disinfectants are mentioned in this connection.

Of disinfectants used for washing floors, furniture, etc., or for the immersion of clothes and other articles, there is a great variety.

It is often mentioned that such disinfectants are supplied free by the Health Authorities, and presumably they are left in the home with written instructions or under direction of the sanitary inspector. In a few instances other articles, such as whitewashing brushes, soap, paper handkerchiefs, etc., are also supplied. In one of the four instances where corrosive sublimate is used tablets of this salt are supplied to the householder; in

another district "responsible people are supplied with crude carbolic or perchloride" for the immersion of food utensils. At Cheltenham, however, the continued use of disinfectants about the room is discouraged.

(c) *The Person Responsible for carrying out Disinfection.*—In Question 14 of the first issue of questionnaires it was asked who superintends the process of disinfection. According to the answers it is the sanitary inspector who in most districts so acts; in four or five large towns, however, it is stated that a man or foreman is specially employed under the direction of the sanitary inspector. In Barnoldswick Urban District the duties are carried out by the porter of the isolation hospital; in Blackpool the operations are supervised by the Infectious Diseases Nurse and in Withnell by the Medical Officer of Health.

(d) *Cost of Disinfection.*—Figures were given in respect of 524 urban and 50 rural districts, while in 60 urban districts the cost was said to be "very little," or words to that effect. Many reporters state that the cost of disinfection depends upon certain circumstances, such as the locality of the case, whether it is treated at home or in hospital, the method of disinfection carried out and the person carrying it out.

The cost is greater in scattered or rural districts where the disinfecting apparatus or materials have to be taken some distance and where, perhaps, transport expenses for some specially employed person has to be met. In the Towcester district, for example, a town case is computed to cost 6s. 5d. and a country case 13s. 11d. Disinfection is usually more expensive where the case is treated at home than when it is admitted to hospital, and examples of this may be seen in the table below:—

TABLE 43.

COMPARATIVE COSTS OF DISINFECTION *for home and hospital treated Patients.*

District.	Cost per case for home-treated patients.	Cost per case for hospital-treated patients
	£ s. d.	£ s. d.
Buglawton U.D.	0 15 9 ...	0 10 4
Repton R.D.	1 0 0 ...	0 5 0
Tunbridge Wells M.B. ..	0 6 0 ...	0 3 0
Wimbledon M.B.	1 0 0 ...	0 15 0
Rotherham C.B.	0 6 4 ...	0 2 2
Kiveton Park R.D. ..	1 5 0 ...	0 7 6

Ely Urban District is an exception to the general rule, and the cost for a home and hospital-treated patient in this district is 3s. 9d. and 6s. 3d. respectively.

An interesting comparison of costs and methods is afforded by the tables below which were sent in by Dr. A. M. Watts and Dr. D. MacDougall respectively.

TABLE 44

Comparison of METHODS AND COST OF DISINFECTION *in the various areas of two Combined Districts in Kent.*

Combined District and M.O.H.	Districts.	(*a*) Bedding, etc.	(*b*) Bedclothes and garments.	(*c*) Furniture.	(*d*) Toys and books.	(*e*) Utensils.	(*f*) Sick-Room.	(*g*) Other parts of house.	Cost.
									s. d.
East Kent No. 1, Dr. A. M. Watts.	Blean R.	Sprayed and steam.	Sprayed.	Sprayed.	Burnt.	Sprayed.	Fumigated. Walls stripped.	Spring-cleaned.	30 0 to 35 0
	Isle of Thanet R.	Steamed.	Steamed.	Washed in disinfectant.	Burnt or disinfected.	Washed in disinfectant.	Contents sprayed and fumigated.	Sprayed.	12 6
	Broadstairs U.	Fumigated and steamed.	Fumigated and steamed.		Burnt.	Boiled.	Fumigated.	Whole house fumigated if case at home for more than 2 or 3 days.	10 0
	Herne Bay U.	Fumigated.	Washed in disinfectant.	Cleansed.	To hospital or burnt.	Scalded.	Fumigated.	Drains, etc., flushed with disinfectant. Spring-cleaning.	5 0
East Kent No. 3, Dr. D. MacDougall.	Ashford U.	Steam.	Steam.	Lamps and spray.	Burnt.	Boiled.	Sprayed and fumigated.	Nil.	6 3
	E. Ashford R.	,,	,,	,,	,,	,,	,,	,,	23 0
	Cheriton U.	Spray and	fumigation.	,,	,,	,,	,,	,,	5 0
	Hythe B.	,,	,,	,,	,,	,,	,,	,,	5 0
	Elham R.	,,	,,	,,	,,	,,	,,	,,	6 2
	W. Ashford R.	,,	,,	,,	,,	,,	,,	,,	4 0

As regards the methods of disinfection that are employed, it is evident that steam disinfection is the most expensive of all. The cost of transport is responsible in some instances, as in the Wanstead and Knutsford districts, where the cost of removing one load of material to the disinfecting station is 21s. and 25s. respectively. In Esher and the Dittons district, householders pay the transport charges when the bedding and clothes of home-treated patients are steam-disinfected. In the returns from other districts interest on the capital cost of the steam disinfector, together with its maintenance charges, are included in the cost of steam-disinfection.* There is considerable variation, however, in the estimated costs of steam disinfection which is probably explained by a similar variation in the local circumstances of different districts. The highest recorded estimates, £3 and £2–£3, are given for the urban districts of Witham and Cheadle and Gatley respectively; on the other hand, the cost per case in Islington, where bedding is removed to the Council's station, apparently for steam disinfection, is 5d.; in Rothwell Urban District the disinfecting measures which include steaming only amount to 2d. per case. Fumigation varies from 2s. to 4s. per room, while spraying appears to be cheaper still; the cost of these measures is reduced (at Wembley by nearly half) when two or more houses are treated on the same day. The highest cost for disinfection that includes no steaming is given for Leominster Urban District, where fumigation and spraying with formalin costs £1 1s. per case. Some examples of comparative costs are shown in table below.

TABLE 45.

Examples of the comparative COSTLINESS OF STEAM DISINFECTION.

District.	Comparative costs.			
	Steaming.	Fumigation.	Spraying.	Other methods.
	s. d.	s. d.	s. d.	s. d.
Millom U.D. ..	19 0	—	—	4 0
Twickenham U.D. ..	25 0	—	2 6	—
Alcester R.D. ..	20 0	3 0	—	—
Bromley M.B. ..	15 0	—	—	2–5 Shillings
Eastleigh U.D. ..	12 0	—	2 0	—
Carlton U.D. ..	7 0	2 6	—	—

Only rarely is the cost of disinfection increased by the employment of extraneous services. In one instance (Southern Combined District of West Sussex) it is computed that the cost of disinfection

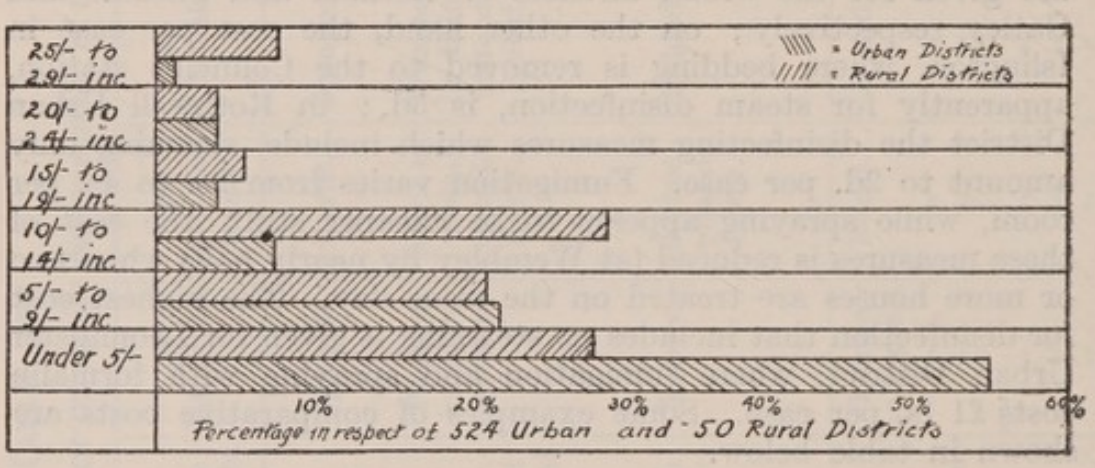
* Dr. Pole, Llanelly, observes that the "Sack steam disinfector" costs little in comparison with other types.

is 30s. where a man is hired for the purpose, as against a cost of 5s. when the work is done by the normal sanitary staff.

It is frequently stated by reporters that the figures of costs given in the answers are only approximate estimates; it is possible, also, that the number of those reporters who note that their figures do not include steam disinfection does not represent all those who have excluded this form of disinfection in their estimates. These considerations should be borne in mind, therefore, when studying Chart No. 4, where an attempt has been made to analyse the figures relating to disinfection costs.

CHART 4.

Percentage grouping of districts according to DISINFECTION COSTS.



The number of returns from rural districts is comparatively small, but the diagram shows, as mentioned before, that disinfection is a more expensive measure in the country than in the towns.

It will be noticed, also, that in over 50 per cent. of the urban districts the cost of disinfection is under 5s. and that it is comparatively rare for it to exceed 10s.

Some further enquiries were made regarding (a) the cost of steam disinfection and (b) the costs involved in houses where paper stripping and cleansing by the landlord is carried out. The results of these enquiries may be related by quotations from the answers of those who were good enough to send this additional information.

(a) *Cost of Steam Disinfection.*

Dr. G. C. Trotter (Islington).—"So far as I can ascertain, the cost to produce steam to furnish a temperature of 240° Fahr. is about 14s. per oven and is made up as follows:—Transport 3s., Wages 5s. and Fuel 6s. It is difficult to estimate in detail the cost per case as sometimes we have two or three infected bundles, and at others fifteen. We went into the question some time ago in connection with commercial disinfection, which we undertake for two firms, and one of these firms we charge 15s. per oven because the work is very frequent, and the other £1 per oven."

Dr. E. G. Annis (Greenwich).—"The maintenance of the disinfection station, per year, is approximately £100; maintenance of motor van, together with driver's wages, £260; disinfecting machine attendant's wages £200 and the wages of the other men necessarily engaged in collecting bedding, disinfecting rooms, etc. £425.

"Roughly this totals £1,000 per annum, and more than a third are cases of scarlet fever.

"In view of the thoroughness with which disinfection is always carried out after cases of scarlet fever, however, one would feel justified in allocating the cost on a slightly higher basis than the numbers themselves would suggest. The actual number of scarlet fever cases for the year is in the neighbourhood of 300 (out of a total of about 750) and if we take it that these 300 cases necessitated one-half of the above-mentioned expenditure, we get a figure of £1 13s. 4d. per case, split up approximately as follows:

	£	s.	d.
Disinfecting Station	0	3	8
Motor Van and Driver	0	9	0
Wages of attendant	0	6	4
Wages of other men	0	14	4
	£1	13	4

"You will understand, of course, that these figures do not include the salary of our Infectious Disease Inspector and his clerk, both of whom are engaged solely in connection with Infectious Disease."

Sir John Robertson (Birmingham).—"Last quarter (April-June, 1925) the cost in Birmingham per case was 6s. 5d., made up as follows:—

	s.	d.
Transport	4	1
Attendants' wages, etc.	1	3
Fuel, gas, water	0	7
Rates, taxes, insurance	0	4
Sundries	0	2

The cost per case will vary very much from time to time because our apparatus is capable of dealing with ten times the amount of work dealt with last quarter. The above costs include sending a disinfecting van to a dwelling house, removing the bedding and other soft goods for disinfection and returning these to the dwelling house. The distance to the dwelling house from the disinfecting station is, in Birmingham, anything up to seven or eight miles. The majority of the journeys are within three miles of the disinfecting station. As a general rule one van is able to remove bedding from more than one house. If each individual house were dealt with separately the cost would be considerably more."

Dr. J. J. Jervis (Leeds).—

	£	s.	d.	£	s.	d.
Bedding Van N.W. 3401	66	0	0			
,, ,, U. 5913	148	0	0			
,, ,, U. 5914	97	0	0			
				311	0	0
3 Bedding Van Motor Drivers ..	430	0	0			
3 Bedding Van Attendants ..	422	0	0			
4 Steam Disinfector Attendants..	570	0	0			
				1422	0	0
Total ..				£1733	0	0

Total number of houses disinfected (all diseases) 2384.
Total cost £1733 equals 14s. 6d. per house.
Annual fixed charges for bedding vans and disinfector are not included in the above figures.
Steam is obtained free, from excess heat of destructors.

Dr. R. Hannah (Bootle).—	£	s.	d.
Transport (including wages of attendants, etc.) ..	354	0	0
Wages of Operator	73	0	0
Coal	45	0	0
Uniform, etc.	9	0	0
Total ..	481	0	0
Less Income ..	21	0	0
Total ..	£460	0	0
Scarlet fever proportion	226	11	4
„ „ cost per case	0	14	3

"This account is not kept separately from those of the hospital generally. The operator does stoking for laundry plant, etc., and attendants for transport have duties in connection with removal of patients and house disinfection. No maintenance costs, such as building repairs, are included as these are inseparable from those of the hospital generally, and consequently the above estimate is, of necessity, an approximation only."

Dr. J. H. Garrett (Cheltenham).—"Our steam is obtained at practically no cost from a boiler heated by the Ash Destructor. It is always ready, its chief use being connected with the electric light. Two men are here employed in the steam disinfecting: Lyddiard, whose other time is connected with horses employed by the Town Council, and Townsend, whose other time is devoted to the job of assistant sanitary inspector. Lyddiard is paid at rate of 8s. 6½d. per day of 9 hours, Townsend 11s. per day of 7 hours. Average time engaged in steam disinfection half a day by Lyddiard and a third of a day by Townsend. Use of horse for half a day whose hire value is 12s. a day. Use of two horse vehicles originally costing about £300 the two. Use of Manlove, Alliott and Co's Steam Disinfector, which I believe with the two-chambered building cost originally about £900. Has been in use 35 years with a trivial annual cost for repairs.

Thus for each case of disinfection after scarlet fever case—

	£	s.	d.
Man's wages for ½ day and ⅓ day respectively	0	8	0
Use of horse for ½ day	0	6	0
Use of vehicles and disinfector (say) ..	0	10	0
	£1	4	0

The cost of the fumigation which is done by Townsend would add approximately 3s."

Dr. N. I. Nankivell (Plymouth).—"The average cost of steam disinfecting in scarlet fever cases in this district is approximately at the rate of seventeen shillings and ninepence (17s. 9d.) per case, allocated as follows:—

Transport	22½ per cent.
Maintenance, etc., of disinfector ..	22½ „ „
Wages of van attendant and stokers ..	55 „ „ „

Dr. R. Craske Leaning (Chiswick).—"The cost of steam disinfection of bedding, etc., is 15s. per case. This work is carried out by

the Ealing Borough Council under a joint scheme and includes cost of collection, disinfection of bedding, etc., and return of same to house.

"Steam disinfection is, however, only carried out in special cases, our usual practice being to rely upon spraying room and contents with formalin, followed by fumigation by formaldehyde."

Dr. J. J. Robb (Enfield).—"The approximate cost per case of steam disinfection is 15s."

Dr. F. A. Spreat (Friern Barnet).—"Actual cost of steam disinfection over 12 months works out at £1 per stoving. It would be misleading to give an analysis as wages, etc., go on whether disinfector is in use or not. An increase of scarlet fever cases reduces the cost per stoving and likewise a decrease increases the cost per stoving. Our costs have stood at £1 for a number of years, and must not be taken as typical. For instance, when the disinfection station can be run in connection with an isolation hospital, a destructor works, or sewage pumping station, where a steam supply is always available, the cost per stoving should be materially reduced. In our case steam has to be raised for disinfection, and even with the infectious disease of the combined districts of Finchley and Friern Barnet, there is not sufficient work to keep the plant fully employed. We may go a week or a fortnight and not have occasion to use the steam disinfector, but the expenses of the disinfection station continue with the exception only of fuel for steam raising. On the other hand, we may have enough work to keep the disinfector continually under steam, when the fuel consumption is large. Wages, horse and vehicle maintenance and overhead charges remain constant, whether there be little or much infectious disease."

Dr. N. H. Linzee (Surbiton).—"The total cost of disinfecting houses and bedding in this district during 1924 amounted to £139 14s. 2d. and is apportioned as follows:—

	£	s.	d.
Manual labour	61	9	2
Disinfectants	16	10	0
Gummed rolls	1	10	0
Use of disinfector	27	15	0
Maintenance of Ford Motor Van	32	10	0
	£139	14	2

All bedding etc., is disinfected by the staff of the Tolworth Isolation Hospital at an inclusive fee of 8s. 6d. for each charge of the disinfecting apparatus. Approximately, the cost for the use of the steam disinfector works out at 5s. per case and for transport at 11s. 8d. per case."

Dr. H. W. Harding (Edmonton).—"Re the cost of steam disinfection the following is applicable to one, two or three lots of bedding, etc.; where possible, we do not light up for one lot only, but unfortunately we rarely have any choice:—

	s.	d.
77 lbs. of coal at 31s. ton ..	1	0¾
35 lbs. of coke at 34s. 10d. ton ..	0	6
Disinfector, 6 hours at 1s. 5d. per hour	8	6
Driver, 1 hour at 1s. 6¼d. per hour	1	6¼
Petrol, etc., wear and tear of van	1	0
	12	7

The motor van, with driver and disinfector, collects and delivers bedding, etc."

Dr. P. G. Horsburg (Scunthorpe).—"Re steam disinfection at Scunthorpe, the following are the overhead charges :—

	£	s.	d.
Cost of Building over 21 years (£130)	4	5	0
Cost of Disinfector over 10 years (£130)	13	0	0
Repairs and maintenance ..	5	0	0
Hand cart for transport of infected and disinfected bedding (£12 over 5 years)	2	8	0
Wages of disinfector (other duties)	10	0	0
Steam	free		
Annual Costs	£34	13	0

"The steam costs nothing as the disinfecting station is alongside the Council Gas Works and the surplus steam is used in the disinfector. No mechanical vehicle or horse vehicle is used ; a special cart was made which we found quite efficient, as this was pushed by a lad and the wage cost naturally was brought down.

"I may mention this disinfector was built just after a smallpox epidemic in 1923, as the cost of destroying bedding was very high and the Council thought it wise, at that time, to build a disinfecting station."

Dr. Walker (Frome).—"Average cost per case of steam disinfecting 8s. for carting to and from house, and labour. Cost of steam. nil ; the waste steam from the destructor is employed."

From these extracts it appears that the approximate cost of steam disinfection per case (or per house) varies between £1 13s. 4d. at Greenwich and 6s. 5d. at Birmingham, and the average approximate cost in these differently circumstanced districts works out at about 17s. In Leeds, Scunthorpe and Frome, where the steam is not produced solely for disinfection purposes, the cost is below the average, but in Cheltenham, where the steam is also obtained free of cost, the expenses are above the average. The cost per case seems to be diminished proportionately to the number of houses or cases disinfected, but at the same time the total annual expenditure on steam disinfection for scarlet fever alone is considerable in large-sized towns : thus £910 at Leeds, £500 at Greenwich, £226 at Bootle. An analysis of the cost totals shows that the biggest item in the expenditure of each place is the wages paid to attendants ; after wages come transport charges, while the actual production of steam—apart from maintenance of plant —seems to be the least expensive item. At Scunthorpe the charges are notably low under each of these three headings.

(b) Some indication of *the cost of wall-stripping*, stopping and re-papering walls, etc., is provided by the information received from Chiswick, Friern Barnet, Edmonton and Enfield.

Dr. Craske Leaning (Chiswick) writes —"The approximate cost to a landlord for stripping, stopping and re-papering walls, cleansing and distempering ceiling after disinfection has been carried out by the local authority is 30s. per room, varying slightly with the class of house."

In *Friern Barnet*, according to the *Sanitary Inspector, Mr. Harman*, the costs are £2 10s. per room, made up as follows:—

	£	s.	d.
Washing off, stopping and whitewashing (with two coats), a ceiling of 16 sq. yds.	0	16	0
Stripping, repairing and repapering a room requiring 4½ pieces of paper at 2s. a piece	0	9	0
Labour involved in stripping, preparing and re-papering walls	0	16	6
Paste	0	0	6
Total prime cost	2	2	0
Profit of 20 per cent. or less	0	8	0
Total final cost ..	£2	10	0

N.B.—Distempering of walls is slightly less costly.

In *Edmonton*, according to Dr. H. W. Harding, "the cost of stripping, cleansing and re-papering a room of the size which obtains in an artisan's house is about £1 1s. 0d.; in some cases 18s. is charged. Unfortunately, Section 5 of the Infectious Disease (Prevention) Act, 1890, does not give us power to re-paper, and in many cases distempering is done. Where we have had to step in and carry out the provisions of Section 5, no re-papering has been done, as we realise that the cost of this could not be recovered."

At *Enfield* the average cost of re-papering, etc., is estimated at £1 15s. per room.

(e) *Opinions on the Value of Disinfection in Scarlet Fever.*—This question was not attempted by all the reporters who answered the previous one, but there is more variety in the opinion given concerning the usefulness of disinfection than there is in the answers describing the methods which are said to be carried out in practice.

The various opinions may be roughly grouped as follows:—

TABLE 46.

Opinions about Disinfection.

Opinion.	Number of Supporters.
Undoubtedly useful	152
Helpful	152
Apparently helpful	35
Total	339
Usefulness doubtful or very doubtful	200
Useless	46
Total	246

From this summary it will be seen that the majority of reporters think favourably of the disinfecting measures which they severally carry out; but it is also evident from this summary, and from the

previous analysis of Question 11, that many health officers have little or no faith in the virtue of terminal disinfection.

Among those who more or less thoroughly believe in disinfection are some forty reporters who add the qualifying condition that the measures, to be useful, must be carried out very thoroughly; "the old routine of sprinkling disinfectants about the house under the impression that it destroys the germs of the prevailing disease is," says one reporter, "a snare and a delusion." In Kingston-on-Hull fumigation by the householder is not accepted by the Health Authorities. Another insists on the intelligent co-operation of the housewife if home disinfection is to be successful. Dr. Rees (Aberystwyth) considers disinfection very effective in a modern house but of very little use in "the usual semi-dilapidated country cottage." A similar opinion with regard to urban dwellings is thus expressed by Dr. Beard of Carlisle: "It must be remembered that, no matter what expedients are used, disinfection is impossible in many of the dirty one or two-roomed hovels." More often, however, occurs the opinion that it is in poor insanitary dwellings that disinfection is most needed. On the other hand, there are reporters who state that when every care is taken secondary cases occur and that when nothing is done no secondary cases follow. Thus Dr. Naylor Barlow writes, "It is worth recording that last year in this Borough no disinfection of houses was carried out. During the year we had the lowest number of notifications on record. I am not quoting this as cause and effect but if any evil results had followed the cessation of house disinfection, one would have expected to find some evidence of them, especially in the number of multiple cases in houses. In this particular also there was no increase." The absence or rarity of secondary cases is the "proof of the pudding" quoted by sixty reporters, many of whom represent country districts or urban areas in which primary cases also seem to be comparatively rare. Dr. Barnes (Camberwell) also states that he has "no record of a secondary case after recovery of a patient." He adds, however, that he has compared the results obtained in two parts of his district in one of which "full disinfection in the ordinary way" was carried out after removal of patients to hospital, while in the other disinfection was camouflaged. "The results gave no practical difference so far as secondary cases were concerned, taking into account the amount of susceptible material." Dr. Glass (Farnworth), also, omitted terminal disinfection in certain houses where other young children lived and there were no secondary cases. Dr. Allison (Kettering) has had a different experience and states that in his district secondary cases often occurred previous to the time when home disinfection was practised. From his experience at Rochester Dr. Pritchett concludes that the rarity of secondary cases means either that house disinfection is very helpful, or that the infection of scarlet fever is far more often carried by the patients themselves than through their belongings.

Referring again to Table 46 it will be seen that 42 per cent. of

the reporters have expressed doubt or disbelief in the efficacy of home disinfection as a whole or as regards certain of its traditional features. The reporters who most emphatically express an adverse opinion concerning the usefulness of home disinfection are Medical Officers for the following districts :—

Metropolitan Borough of Wandsworth ; County Boroughs of Barrow-in-Furness, Bootle, Halifax, Newcastle, Portsmouth, Wolverhampton ; Urban Districts of Acton, Bedlingtonshire, Bromley, Caerleon, Barking, Chelmsford, Finchley, Hitchin, Leiston-cum-Sizewell, Ludgvan, Maldon, Narberth, Neath, Paignton, Raunds, Sandgate, Sedgeley, South Crosland, Stanley, Swanage, Taunton, Tottenham, Ulverston, Woodford, Willesden ; Rural Districts of Clitheroe, Easington, Guildford, Helmsley, Hendon, Isle of Axholme, Pickering, St. Columb Major, Taunton, Truro ; and Leicestershire Combined District.

The bacteriological case against chemical disinfection is put as follows by Dr. K. Simpson (Barking). "Although certain strains of haemolytic streptococci have been described in septic cases of the disease, more especially in lesions such as otitis, no bacteria having any direct bearing on the pathogeny of scarlet fever have been cultivated—such being the case, it is not, I submit, reasonable to suppose that room surfaces can possibly sustain or disseminate the infection of this disease, which has only been transmitted by direct inoculation, so far as I know, from a patient to another individual. The natural corollary is, therefore, that infection is spread through personal transference—there being no evidence that the causative bacterium, whatever it is, can exist apart from its natural pabulum in the human organism ; spread takes place from known cases, missed cases and carriers. Disinfection of rooms, etc., apart from freshly soiled fomites, is, in my opinion, of no avail in preventing the spread of the disease."

It may be remarked that the Borough of Brighton is not included in the list above, but Dr. Forbes' contention is that there is no necessity for any *official* intervention and expenditure in the case of private homes where any desirable measures of disinfection can be carried out by the householder ; Dr. Ransome (Southgate) also thinks it is very doubtful whether there is any need for municipal disinfection. The list given above, however, includes many districts where the medical officer of health considers disinfection a "waste of time and money," by whomsoever undertaken.

Among the larger districts whose health officers are sceptical or doubtful whether the spread of scarlet fever is prevented by disinfection, the following may be mentioned :—

Birmingham, Blackburn, Bournemouth, Burton-on-Trent, Cardiff, Carlisle, Chester, Gateshead, Gosport, Hastings, Leamington Spa, Leeds, Leicester, Leyton, Newport, Norfolk, Nuneaton, Ramsgate, Rochdale, St. Pancras, Salisbury, Sidmouth, South Darley, Wakefield, Wellingborough, Worksop.

Included among the health officers of the districts mentioned above and also among those who, on the whole, favour the practice of disinfection, are a considerable number of reporters who think

that fumigation, spraying and other such measures are desirable apart from any chemical disinfection which they may or may not achieve. Thus Dr. Williams (Todmorden) writes: "The time would be most inopportune to discontinue disinfection. The actual disinfection is only a part of what takes place. The whole house generally is thoroughly cleansed under supervision"; in Ealing terminal disinfection often "provides the opportunity for sanitary improvements and decorative repairs." In Wednesbury (Dr. Morris reports) "the thorough cleansing and leaving windows open for a day is necessary owing in many cases to the disturbance caused by disinfection; therefore it is advisable to make a big mess in some houses and the after-effects are most helpful." Another reporter, on the contrary, thinks that "spring-cleaning stirs up an infection not previously destroyed."

Then there are not a few health officers who, while being sceptical, perhaps, about the bacteriological credentials of disinfection, yet consider it advisable to continue the traditional methods on grounds of public policy. Dr. Hope, for example, considers disinfection "a necessary procedure in the present state of public opinion." Other views include the following:—

Dr. Boobbyer.—"I am not inclined to attach much value to these expedients among clean, intelligent and better-class people; but I should be loath to abandon them even among this class of the population on account of the example, in care and cleanliness, afforded among the poor (and especially the slum dwellers)."

Dr. Banks (*Halifax*).—"I have been convinced by the experience of Dr. Forbes of Brighton and if I were to consult my own wishes entirely, I should adopt his methods. The argument against relaxation of present method is that the people will grow careless if they think we do not regard scarlet fever as highly infectious."

Dr. Davison (*Maldens and Coombe U.D.*).—"I consider disinfection of great practical value, more so in homes not up to the standard of cleanliness which is desirable. It would be regrettable to discontinue disinfection as it would tend to make people contemptuous of infection."

Dr. Dupont (*Twickenham*).—"I am not convinced that they have any effect beyond encouraging a complete 'cleansing up' of the room afterwards, except perhaps (*b*)."

Dr. Hunter (*West Bridgford*).—"There would be an outcry if such measures were abandoned."

Dr. Jervis (*Leeds*).—"Help in actually preventing spread is doubtful but the help as an object lesson to the public as regards the care to be taken in infectious diseases is great."

Dr. Yeoman (*N.W. Cheshire C.D.*).—"For 30 years the people here have been instructed that such measures were essential to stamp out scarlet fever and it would take a century to stamp out this instruction."

Other reporters think that disinfection "creates a sense of comfort" or has a "valuable moral effect." Thus Dr. Hollis (Woodbridge) "always advocates what is called 'disinfection' to be carried out; people are more contented when it is done." In Cheltenham disinfection is thought to be of considerable use "in satisfying a fearful public." Dr. Cooper Pattin considers that "the annoyance connected with the stench of the disinfectant—leading

to the opening of windows, etc., and to general cleansing—is beneficial to the house and soothing psychologically to the nervous."

Dr. Kerr (Newcastle), while considering steam disinfection to be essential, states that "spraying and other forms of chemical disinfection are often deliberately used as a 'placebo'." One reporter frankly states that he has not the courage of his convictions: "Personally, I believe the patient only infectious and that disinfection is hardly necessary, but I should not be courageous enough to cease disinfection." There are other reporters also whose answers show that they have the same views concerning the origin of infection if not the same misgivings about putting them in practice. Two or three reporters express themselves as being of open mind on the subject and desirous of guidance; Dr. Gibson (Wakefield) would "like to see the result of an experiment of doing without" (disinfection).

Some fifty reporters specify the directions in which they consider disinfection measures can be usefully or most usefully carried out. All these reporters, except one, consider that disinfection of the bedclothes and personal garments is essential or very desirable, while only thirteen consider that there is no use in disinfecting the bedding; in some of these instances it is not the principle itself that is condemned but the method adopted for carrying it out. The treatment of toys and books (*d*) comes next in importance, while as regards the furniture (*c*), utensils (*e*) and rooms in the house (*f* and *g*) a large majority of the fifty reporters state or imply that no useful purpose is served by chemical disinfection methods. Illustrative answers are the following:—

> *Dr. Heaven* (*Keynsham R.D.*).—"Whether they are all necessary seems a debatable question. Steaming clothes, bedding, etc., soiled with nasal or throat discharges, seems a reasonable precaution. Food utensils must be dealt with. Whether spraying rooms is necessary is questionable. Thorough ventilation and spring-cleaning would probably be equally effectual."
>
> *Dr. M. Porter* (*Helmsley R.D.*).—"I consider fire and boiling the best. I think very little of steam and baking. 'Weathering' properly done is very helpful . . . but the majority of the disinfections even when properly and conscientiously carried out are utterly ineffective. I have seen infection after steaming and baking and certainly after rooms have been supposed to be disinfected . . . I prefer exposure to weather with its wind and sun."
>
> *Dr. Veitch Clark* (*Manchester*), considers treatment of the bedding, bedclothes and toys essential but in the case of furniture and food utensils he considers that "ordinary washing and cleansing would almost certainly produce equally good results."

There are not a few other reporters who think highly of what may be termed the "soap and water method" aided by sun and ventilation. Thus:—

> *Dr. Daley* (*Blackburn*).—"I consider that equally good results would be obtained if we could ensure that the bedding was thoroughly washed, personal clothing exposed to the sunshine, and if the wind and sun were allowed access to the room for a few days. In practice it is almost impossible to ensure that this will be done and I am not at the moment sufficiently sure of my opinion to be able to give up disinfection altogether."

Dr. Horne (*Poole*).—"The shortcomings of actual disinfection can be reduced by encouraging the use of soap and water and wet dusting; and by the 'fear factor' of infectivity which should be maintained amongst the lay public."

To these statements may be added one from Dr. Harries (Birmingham), who, writing from the hospital point of view, says:—

"For some years we have entirely abandoned sulphur or formalin vapour in the 'disinfection' of wards after cross-infection. We rely solely on soap and water, fresh air and sunlight. We have had no reasons for regret. Current disinfection is, of course, constantly in progress."

As a rule the few references of steam disinfection are favourable; one of the exceptions is that of Dr. O'Connor (Leicestershire C.D.), who thinks steam disinfection an "unnecessary expense." There are very few references also to spraying and fumigating, but most of these are unfavourable. The boiling of body clothes and soiled linen and the sterilisation of food utensils are each strongly recommended by two or three reporters, while the carbolic sheet is referred to once, as merely a "symbol of isolation."

(*f*) *Comparative Results of Various Methods of Terminal Disinfection as Measured by the Occurrence of Secondary Cases.*—Terminal disinfection in scarlet fever was made the subject for further investigation, and special questionnaires were sent to two groups of districts. One group consisted of sample districts in which it appeared (from the main enquiry) that terminal disinfection was considered a useful procedure and where traditional methods were said to be carried out; the second group comprised towns and districts in which the efficacy of terminal disinfection is apparently in question and where the methods employed have been consequently, more or less, modified. The object was to obtain figures for the years 1922–3–4 which would afford a comparison of the two groups as regards the percentage of infected homes in which secondary cases occurred. "Secondary" cases, it was explained, should not include in this instance "return cases," nor any arising within seven days of the last patient's departure for hospital (or his isolation at home), and which may have shared with him a common source of infection. The forms were also arranged for the separate consideration of hospital and home-treated patients respectively, and in this way some incidental and additional information concerning the respective merits of home and hospital treatment was obtained. Thus in many of the large towns the proportion of houses producing secondary cases was about equal both in regard to home-treated patients and to hospital-treated patients; while, in a small majority of the remaining 22 districts, the results were better in the houses where patients were kept at home than in those where they were removed to hospital. It was pointed out by some reporters, however, that the figures for home-treated cases were not so valuable as the others because home-nursing was only allowed in selected houses where an unusual degree of care and cleanliness might be expected.

Regarded as a whole the figures obtained through this subsidiary investigation rather bear out the statement frequently made in the main questionnaire that secondary cases are comparatively rare nowadays.

But the returns also show that among the towns which follow similar traditional methods of disinfection there is considerable difference in the results obtained. In Rotherham, for instance, out of 267 infected homes, 22 (8·2 per cent.) were involved between them with 50 secondary cases ; in Hove, on the other hand, out of 245 infected homes 3 (1·2 per cent.) only were involved with (3) secondary cases.

In Table 47 below an attempt is made to compare the results obtained in certain districts of the two groups of districts described above. Of the districts from which additional information was obtained this table only includes those in which a hundred or more cases were treated, both in hospital and at home, during the three years under review. It will be noticed that the headings in the Y portion of the table are placed in the reversed order of similar headings in the X half, so that the two criterion columns may be the more conveniently compared.

Table 47.

Terminal Disinfection and Secondary Cases.

Comparison of Secondary-Case-Rates (i.e., *percentage of infected houses in which Secondary Cases occurred*) *between towns where traditional methods* (*including steam disinfection*) *of disinfection are carried out and towns in which some modification* (*see Note* p. 147) *of these methods obtain.*

Hospital-treated cases.

Traditional methods (X) A. Town or district.	B. No. of cases treated.	C. No. of homes involved.	D. Percentage of homes (*c*) in which secondary cases occurred.	Modified methods (Y) D^1 Percentage of homes (c^1) in which secondary cases occurred.	C^1 No. of homes involved.	B^1 No. of cases treated.	A^1 Town or district.
Hove	299	245	1·2	0·0	117	130	Leicester and Rutland C.D.
Sunderland ..	150	137	1·4				
Surbiton ..	133	108	1·8				
Islington ..	1049	944	2·0				
Edmonton ..	475	405	2·2	2·2	180	216	Guisborough C.D.
Bournemouth ..	292	228	2·6				
Manchester ..	1341	1142	2·9				
Brentford ..	170	131	3·0	3·0	488	507	Brighton.
Croydon ..	1108	844	3·2	3·2	474	722	West Berks United D.
				3·2	311	382	Halifax.
				3·4	116	120	Hawarden.
S. Shields ..	1001	824	4·4	4·4	270	283	Annfield Plain.
				4·6	128	150	Wallasey.
				4·8	207	236	Batley.
Tottenham ..	315	257	6·6				
Rotherham ..	367	267	8·2				

Home-treated cases.

				0·0	104	123	Halifax.
				2·1	95	115	Leicester and Rutland C.D.
				2·9	172	201	Brighton.
Manchester ..	443	392	3·0				
				4·3	115	133	Wallasey.
Dudley ..	206	178	5·0				
Croydon ..	189	163	5·5	5·5	126	198	West Berks United D.
				10·9	174	220	Guisborough C.D.
				11·4	966	1210	Tottenham.

Note.—In the West Berks, Leicester and Guisborough combined districts steam disinfection is rarely carried out; in Annfield Plain and Hawarden R.D. the bedding and clothes are sprayed or washed with disinfectant and exposed to the air; in Wallasey, Halifax and Batley little beyond spring-cleaning is normally done in the sick-room; in Tottenham no measures are undertaken in the case of home-treated patients; in Brighton no municipal disinfection is done in the case of private houses.

Prima facie, perhaps, the table above suggests that, as regards houses in which the primary cases were sent to hospital, the towns which practise traditional methods appear in rather a better light than those using modified methods; but in reality there is little to choose between the two groups of towns. The larger figures generally in columns B and C enhance, perhaps, the value of the figures in column D. At the same time the two highest percentage figures are provided by "traditional towns" and the lowest by a "modified district." Brighton, it may be noted, stands high in its own group and shows a result nearly as good as that of Bournemouth or Manchester among the "traditional towns."

In the lower half of the table relating to houses where patients are nursed at home, the best positions are secured by the "modified towns" with Halifax and Brighton high up; but Guisborough Combined District and Tottenham occupy the lowest places with the two highest percentages of the whole table.

The comparatively few instances where, in the same place, a change of method has been tried at different times or where concurrently in different areas of a district two methods of disinfection have been contrasted may now be enumerated.

Brighton.—In Table 48 below (where the criterion used is the ratio of subsequent cases to the total number of cases admitted to hospital) it will be seen that Dr. Forbes contrasts the results of three consecutive periods. In the first period, 1900–1909, full disinfection in all cases was carried out by the municipality; in the second period, 1910–1920, the municipality only undertook the spraying of rooms, while from May 1st, 1921, the disinfection of private houses other than those occupied by dairymen and teachers has been left entirely to the householder. It will be further noted that the suspension of steam disinfection for bedding, etc., in 1910 was followed by a fall in the "subsequent" (secondary) case-rate, but the further abatement as regards spraying was followed by a slight rise.*

* Dr. Forbes in his covering letter remarks that the figures in the bottom line of the table "look worse than they really are" and that subsequent cases also occurred in hotels, boarding houses, etc., where full disinfection is still carried out.

TABLE 48.

Brighton: Comparative records of SECONDARY CASES *in respect of three* DIFFERENT POLICIES OF TERMINAL DISINFECTION.

	Cases removed.	Day on which subsequent case occurred.					Total after 7th day.
Disinfection by the Municipality. 1900–1909 inclusive.	2,103	0–7: 85	8–14: 18	15–21: 10	22–35: 5	35: 4	37
Full disinfection.	Cases per 1,000	40·4	8·6	4·8	2·4	1·9	17·6
*Municipal disinfection stopped but rooms sprayed.	3,027	119	27	12	7	5	51
1910–1920 inclusive	Cases per 1,000	39·3	8·9	4·0	2·3	1·6	16·8
*Disinfection and cleansing entirely by housewife.	955	28	13	3	1	1	18
From May 1st, 1921, to April 30th, 1925	Cases per 1,000	29·3	13·6	3·1	1·0	1·0	18·8

* Complete disinfection continued in hotels, boarding houses, residential schools, houses of dairymen and teachers.

In a note subsequently received, Dr. Forbes states that if he reverted to the old policy of municipal disinfection in all cases the additional cost (leaving out capital expense of a special motor van) would be £415, made up as follows :—

	£	s.	d.
One new man at the disinfecting station	150	0	0
Fuel for disinfection of bedding ..	25	0	0
Removal of bedding to and from Sanatorium (petrol; portion of cost of renewals, etc.)	100	0	0
Increased labour—one more disinfector	100	0	0
Cost of disinfectants	40	0	0
	£415	0	0

Here also may be given some figures supplied by Dr. Walker which show when each secondary case occurred in the series investigated at South Shields.

TABLE 48A.

South Shields: TIME INCIDENCE OF SECONDARY CASES.

Hospital Cases.

Days after removal of primary case..	8	9	10	11	12	13	14	16	17	19	20	23	25	31	32	33	34	37	42
No. of cases ..	4	2	1	3	3	3	4	2	1	1	2	1	2	1	1	1	1	1	1

Home Cases.

Days after notification.	9	10	13	15	24	31	35
No. of cases	1	2	1	1	1	1	1

Willesden.—Dr. G. F. Buchan began to investigate the results of disinfection after scarlet fever and diphtheria in 1917 by dividing the Urban District of Willesden into two nearly equal areas ("X" and "Y") for purposes of comparison. In Area "X" only the sick room was disinfected (formalin spray) after a case of scarlet fever, but in Area "Y" the patients' bedding and clothing were removed for steam disinfection as an additional measure. The results of this first investigation are shown in Table 49 (A) below. During the years 1918 to 1921 inclusive the same district (Willesden) was divided into three areas. In Area (1) the method of disinfection employed was fumigation of rooms (formalin and spray) only, in Area (2) fumigation of rooms and steam disinfection of bedding and clothing, and in Area (3) steam disinfection of bedding and clothing only. The results of these extended investigations are shown in Tables 49 (B) 1918 and 49 (C) 1919–21.

Table 49.

Willesden: Results of Different Methods of Disinfection (*after Scarlet Fever and Diphtheria*) Employed in Different Parts of the District at Various Times.

A.—*Results of Dr. Buchan's Experiments in* 1917.

	Area X. Pop. 84,475 Fumigation of rooms by formalin spray only.	Area Y. Pop. 84,870. Fumigation of rooms by formalin spray, with removal and steam disinfection of bedding and clothing.
No. of houses invaded	61	64
(*a*) No. of houses in which secondary cases occurred previous to the return of any patient from hospital or release from home isolation.	6	8
Percentage of homes invaded in which secondary cases occurred previous to the return of any patient from hospital or release from home isolation.	9·8	12·5
(*b*) Total number of such secondary cases.	7	17
Secondary cases percentage of homes invaded (i.e. per cent. of primary cases).	11·5	26·6
(*c*) No. of such secondary cases having onset more than 7 days after disinfection of primary cases.	3	4
Such secondary cases percent. of homes invaded (i.e. per cent. of primary cases).	4·9	6·2

B.—*Results of Dr. Buchan's Experiment in* 1918.

	Area 1. Pop. 84,464. Fumigation of rooms by formalin spray only.	Area 2. Pop. 48,141 Fumigation of rooms by formalin spray with removal and steam disinfection of bedding and clothing.	Area 3. Pop. 36,753. Steam disinfection of bedding and clothing only.
No. of homes invaded	59	33	19
(*a*) No. of homes in which secondary cases occurred previous to the return of any patient from hospital or release from home isolation.	4	4	3
Percentage of homes invaded in which secondary cases occurred previous to the return of any patient from hospital or release from home isolation.	6·8	12·1	15·8
(*b*) Total number of such secondary cases.	4	5	3
Secondary cases per cent. of homes invaded (i.e. per cent. of ordinary cases).	6·8	15·2	15·8
(*c*) No. of such secondary cases having onset more than 7 days after disinfection of primary case.	0	2	0
Such secondary cases per cent. of homes invaded (i.e. per cent. of primary cases).	0	6·1	0

C.—*Results of Dr. Buchan's Experiment in* 1919, 1920 *and* 1921.

	Area 1. Population 1919–85,149 1920–85,327 1921–82,105 Fumigation of rooms by formalin spray only.	Area 2. Population 1919–48,279 1920–48,291 1921–48,550 Fumigation of rooms by formalin spray, with removal and steam disinfection of bedding and clothing.	Area 3. Population 1919–37,197 1920–37,274 1921–36,545 Steam disinfection of bedding and clothing only.
No. of homes invaded	1,018	648	313
(*a*) No. of homes in which secondary cases occurred previous to the return of any patient from hospital or release from home isolation.	133	80	41
Percentage of homes invaded in which secondary cases occurred previous to the return of any patient from hospital or release from home isolation.	23·1	12·3	13·1
(*b*) Total number of such secondary cases.	161	123	57
Secondary cases per cent. of homes invaded (i.e. per cent. of primary cases).	15·8	19·0	18·2
(*c*) No. of such secondary cases having onset more than 7 days after disinfection of primary case.	10	26	2 Both probably return cases to another family.
Such secondary cases per cent. of homes invaded (i.e. per cent. of primary cases).	1·6	5·8	1·2 should probably be 0.

Dr. Buchan makes the following remarks concerning his investigations :—

> "It will be observed from both inquiries, namely the inquiry conducted in the year 1917 and that conducted in the years 1918, 1919, 1920 and 1921, that steam disinfection of bedding and clothing appeared to increase the number of secondary cases occurring and that fumigation of rooms by formalin spray only without steam disinfection of bedding and clothing appeared to be most effective in preventing secondary cases arising. These results are so divorced from the common sense of disinfection (for it would appear reasonable to believe that the more complete the disinfection the fewer would be the secondary cases) that I think we are forced to the conclusion that disinfection exerts no influence on the occurrence or non-occurrence of secondary cases. Particularly having regard to Table C herewith, it will be noted that the last line shows that the addition of steam disinfection to fumigation of rooms appeared to increase the percentage of secondary cases from 1·6 to 5·8, therefore the disinfection of bedding would appear to be useless ; similarly, the addition of fumigation to steam disinfection appeared to increase the percentage of secondary cases from at most 1·2 to 5·8, therefore fumigation of rooms would appear to be useless. It would, therefore, appear reasonably safe to conclude that neither steam disinfection nor fumigation as aforesaid are of any value in controlling the occurrence of secondary cases. These conclusions are supported by the continued prevalence of scarlet fever in spite of the practice of disinfection."

Chatham.—Since the autumn of 1921 Dr. Holroyde has discontinued the practice of room fumigation in Chatham and relies only on spring-cleaning and ventilation ; the comparative results are tabulated below.

TABLE 50.

Chatham : Results of ROOM FUMIGATION *compared with those of* SPRING-CLEANING.

Period.	Method of room disinfection.	Percentage of infected homes where secondary cases occurred.	
		Hospital cases.	Home cases.
1918–1921	Room fumigated ..	5·2	5·6
1922–1924	Ventilation and spring-cleaning.	4·5	20·0*

Dr. Holroyde adds :

> "I do not see that the practice of disinfection has any material effect in checking the occurrence of a certain percentage of secondary cases and I am inclined to ascribe them to the presence of missed cases or to delay in seeking medical advice and not isolating the patient at the onset of illness."

* This percentage, as it stands, appears irreconcilable with Dr. Holroyde's conclusions, but in only a very small number of infected houses were the patients treated at home.

Gillingham.—Here much the same change has been made by Dr. Muir, with results as shown below.

TABLE 51.

Gillingham (Kent): Results of ROOM FUMIGATION *compared with those of* SPRING-CLEANING.

Period.	Method of room disinfection.	Percentage of infected homes where secondary cases occurred.	
		Hospital cases.	Home cases.
1923	Fumigation	3·5	0·0
1924	Spring-cleaning ..	2·0	0·0

In the *East Kent* (No. 3) United District, the *Leicestershire and Rutland Combined District* and in the *West Berks United District* it is reported that the results in those component districts where steam disinfection is used are no better than in those (the majority) where steam disinfection is not carried out.

F. Practice regarding the continuance at or return to school, business, etc., of contacts and convalescents respectively. (*M.O.H. forms*; *first issue*; *Sect. B., Q.* 11; *second issue*; *Sect. B., Q.* 10.)

Information on this question was given by over 90 per cent. of the reporters. In twelve or so instances it was stated that the control of scarlet fever convalescents and contacts was carried out in accordance with certain authoritative recommendations on the subject such as those issued by the Local Government Board, Board of Education, County Councils and Association of School Medical Officers. These instances excepted, however, all the answers record, with a varying amount of detail, the practice locally adopted in the different districts. Analysis of these answers brings out the following facts :—

1. *Convalescent Children.*—About half the number of Medical Officers use a time limit in deciding when a child can safely return to school after an attack of scarlet fever; by the remaining half various other criteria are used. Thus :

(*a*) Child allowed to attend school :

(i)	On day of release from isolation or discharge from hospital	21 districts.
(ii)	So many days after this happens	463 ,,
(iii)	When peeling is complete	62 ,,
(iv)	So many days after this event	23 ,,
(v)	When peeling and nasal discharge have ceased	16 ,,
(vi)	When all nasal and ear discharges have ceased	38 ,,

(*b*) Child isolated :
(i) For at least 6 weeks .. .. .. 114 districts.
(ii) "Until cured," "free from infection," etc. .. .. 48 ,,
(*c*) Decision left to the medical attendant .. .. 3 ,,

Included among the districts in (*a*) are those in which the answers seem to imply that home-treated patients may return to school as soon as personal and domestic disinfection have been accomplished. The places in which children are allowed to return to school as soon as they are discharged from hospital are the urban districts of Willesden, Harwich, Ryde, Withnell and Padiham.

Fourteen days is the usual period mentioned by those who prefer a certain time to elapse between the discharge of children from hospital or home isolation and their return to school.

An analysis of the 463 answers in which time limits are mentioned is set out in the table below.

TABLE 52.

Time periods between release from hospital or home isolation and return to school.

Time periods in days.	Number of districts in which such time period is observed.
7	33
7–10	2
7–14	2
8	2
10	26
10–14	1
14	320
14–21	8
14–28	3
21	36
28	30

The districts included in (iii) and (iv) evidently attach primary importance to the condition of the skin, but completion of peeling is a condition not infrequently added by those who mainly act on the time-limit rule. Fourteen days, again, is the time most frequently mentioned by those who defer resumption of school attendance until some time after peeling has stopped.

2. *Contact Children.*—The rule observed in different districts regarding the school attendance of children in homes whence a scarlet fever patient has been removed to hospital may be classified under the following groups :—

(*a*) Allowed to resume school attendance :—
(i) On the day of, or day after, removal of patient to hospital .. .. .. 2 districts.
(ii) So many days after this event or after disinfection of room .. .. .. 513 ,,
(iii) When the period of incubation is over .. 25 ,,
(*b*) No control where the contacts have had scarlet fever .. .. 6 ,,

In Tottenham and Acton Urban Districts contacts are allowed to attend school without a break provided respectively that they are not ailing, and if they are specially watched while at school. In the Catherington Rural District contacts are " disinfected with baths and allowed to return to school." There are some 13 or 14 answers also in which it is stated that contacts return to school after disinfection of the patient's room, but it is not clear whether the disinfection refers to cases treated at home or those sent to hospital.

As in the case of convalescents, the majority of the answers show that children in homes from which patients have been removed to hospital are kept from school for various periods, which are shown below.

TABLE 53.

QUARANTINE PERIODS *for Children who have been in Contact with Patients removed to Hospital.*

Period of quarantine imposed.	Number of districts imposing such a period.
7 days	74
7–10 ,,	4
7–14 ,,	2
8 ,,	17
10 ,,	99
10–14 ,,	10
12 ,,	3
14 ,,	289
14–21 ,,	2
21 ,,	15
21–25 ,,	1
28 ,,	1

Children in houses where scarlet fever patients are nursed are kept from school for longer periods than those associated with relatives who have been removed to hospital. The conventions concerning such contacts, as recorded in the answers, are as follows :—

(i) Detained for length of patient's illness ..	60 districts.
(ii) Can resume school on day of patient's release from isolation	34 ,,
(iii) Can resume school so many days after the release of patient from isolation ..	127 ,,

The various time limits in (iii) are shown below :—

TABLE 54.

QUARANTINE PERIODS *for Children who have been in Contact with Home-treated Patients.*

Period of quarantine imposed.	Number of districts imposing such a period.
7 days	14
7–14 ,,	1
10 ,,	22
14 ,,	82
21 ,,	6
28 ,,	2

3. *Adult Contacts.*—It is the exception to find in the answers to Questions 10 or 11 any particular reference to adult convalescents or contacts, and when the latter are mentioned it is most commonly said that no control over their movements is exercised or attempted. In approximately 10 per cent. of the answers, however, there is evidence that restrictions of various kinds are advised in the case of certain classes of adult contacts. These include those who live in homes where food is produced, prepared or kept on sale (dairies, milkshops, provision shops, etc.); those whose work brings them in contact with clothing (cloth workers, laundresses, etc.); those who may be engaged outside the home in any of the above occupations, and those engaged in public duties, particularly teachers, postmen or railway porters.

It may be noticed that the circumstances of these individuals are just those in which most of the authorities consider it imperative to remove scarlet fever patients to hospital. As contacts of such patients, therefore, these individuals probably do not occasion as much concern as if they lived in households where the patient is home-nursed.

In some districts a period of quarantine is imposed on such workers, as in the case of children, but the usual period with adults is not 14 but 7 days. In a few instances such abstention from work is due to the wish of the employer; in other instances where no control is exercised the Medical Officer of Health informs the employer of the circumstances. The conditions, mentioned in the answers, under which adult contacts are allowed to continue their work with little or no interruption include the following:—

(i) When personal disinfection has taken place.
(ii) When premises have been disinfected.
(iii) If the worker boards out or otherwise keeps away from the patient.
(iv) If he reports himself for observation.
(v) If he obtains a medical certificate of good health.

G. Hospital and Home Isolation compared. (*Hosp. forms: Sect. A., Qs.* 6 *and* 7; *Sect. B., Qs.* 1, 3, 5, 6, 7, 8, 9 *and* 16; *and Sect. C.*)

Many of the questions in the enquiry forms were deliberately designed to get comparative information concerning the methods of dealing with scarlet fever cases by hospital isolation and home isolation respectively. Some of the answers to these questions are concerned with *facts*, a whole section is devoted to *figures*, while other answers record the *opinions* of Medical Officers of Health on certain aspects of the "hospital *versus* home" question.

1. Hospital Facilities in England and Wales.

The answers to Question 6 in Section A shew that, as far as England is concerned and in so far as the returns sent in are

representative hospital facilities for the control and treatment of scarlet fever have now been secured by the great majority of Local Authorities for their respective Districts. From the answers to Question 7 of Sect. A (See Model A), which are summarised in Appendix L, it appears that the effort to secure hospital facilities began about 1880 and that during the three decades covering the period 1881 to 1910 hospital isolation was initiated in the great majority of districts from which the reports have been received.

On the other hand, there are a few districts and towns which still possess no isolation hospital of their own or in which, according to their reporters, hospital facilities are lacking or very inadequate. The county distribution of such districts and towns is as follows :

England—Bucks 2, Cornwall 16, Cumberland 3, Derby 1, Devon 5, Ely 2, Lancs 4, Lincs 2, Norfolk 11, Northants 7, Northumberland 3, Notts 3, Somerset 8, Staffs 3, Wilts 1, and Yorkshire 5. *Wales*—Brecknock 1, Cardigan 5, Carmarthen 6, Denbigh 2, Flint 1, Glamorgan 3, Merioneth 3, Monmouth 3, Pembroke 4, and Radnor 1.

From this list it is seen that the chief localities where hospital facilities are said by the reporters in this enquiry to be absent or inadequate are the West of England (particularly Cornwall), Norfolk (rural districts) and Wales (chiefly S. Wales).

2. The Extent to which Hospital Facilities are used.

The statistical returns show that most of the towns and districts possessing hospital facilities make good use of such and it appears that in these places a majority of the notified cases are treated in hospital rather than at home.

In Appendix H an attempt has been made to assess, from the statistical returns and for urban and rural districts separately, the proportion of districts in which either hospital or home isolation is the rule or in which both methods are adopted. The districts or towns are considered in the aggregate according to their county location, and the counties are grouped into eleven areas, including London. The hospital-isolating group (*a*) (Cols. 4 and 14) includes those places in which at least 100 cases were notified during the years 1914 to 1923 inclusive and where, during this period, an average of 60 per cent. or more of the patients were admitted to hospital ; hospital-isolating group (b) (Cols. 5 and 15) includes the less valuable records where the number of cases notified in the 10 years did not reach 100. The same criteria are used in the grouping of home-isolating cases (*a*) and (*b*) (Cols. 7, 8, 17 and 18), but a third group is added here which includes the districts where hospital facilities are said to be absent (Cols. 9 and 19). The hospital-and-home group (Cols. 11 and 21) includes places in which, on an average during the years 1914–1923, the number of notified cases was about equally divided between hospital and home. The percentage results are extracted from this analysis table and reproduced below for convenience.

TABLE 55.

LOCAL PRACTICE IN ENGLAND AND WALES REGARDING TREATMENT OF SCARLET FEVER IN HOSPITAL AND AT HOME.

(Summarised from Table in Appendix H.)

Shows the proportion of Districts in the Counties of England, and in Wales as a whole, which (1) *mainly adopt Hospital Treatment,* (2) *mainly adopt Home Treatment,* (3) *use both methods.*

		Urban figures.				Rural figures.			
Division.	County.	No. of places where records were examined.	Percentages.			No. of places where records were examined.	Percentages.		
			Hospital isolating.	Home isolating.	Hospital and Home.		Hospital isolating.	Home isolating.	Hospital and Home.
London	Sixteen Met. Boroughs.	16	100·0	—	—	—	—	—	—
South Eastern	Surrey	24	95·8	4·2	—	7	85·7	—	14·3
	Kent	33	90·9	6·1	3·0	20	85·0	5·0	10·0
	Sussex	20	55·0	35·0	10·0	16	37·5	37·5	25·0
	Southants	12	83·3	16·6	—	18	55·6	27·7	16·7
	Berks	7	57·1	14·3	28·6	11	27·3	36·3	36·3
	I. of Wight	5	60·0	20·0	20·0	1	100·0	—	—
		101	80·2	13·9	5·9	73	58·9	21·9	19·2
South Western	Wilts	9	77·8	—	22·2	13	84·6	15·4	—
	Dorset	8	75·0	12·5	12·5	4	50·0	25·0	25·0
	Devon	17	41·2	47·0	11·8	8	37·5	62·5	—
	Cornwall	13	7·7	76·9	15·4	5	—	100·0	—
	Somerset	12	41·7	41·7	16·6	11	27·3	63·6	9·1
		59	44·1	40·7	15·2	41	46·3	48·8	4·8
South Midland	Middlesex	26	88·5	11·5	—	1	100·0	—	—
	Herts	11	100·0	—	—	5	80·0	—	20·0
	Bucks	6	50·0	33·3	16·6	4	50·0	50·0	—
	Oxford	6	33·3	50·0	16·6	7	71·4	28·6	—
	Northants	11	54·5	45·4	—	10	10·0	80·0	10·0
	Hunts	2	100·0	—	—	3	33·3	66·6	—
	Beds	5	100·0	—	—	3	100·0	—	—
	Cambs.	1	100·0	—	—	5	40·0	60·0	—
	Isle of Ely	2	50·0	50·0	—	3	33·3	66·6	—
	Peterboro'	—	—	—	—	1	—	100·0	—
		70	77·2	20·0	2·8	42	47·6	47·6	4·8

TABLE 55—*contd.*

Division.	County.	Urban figures.				Rural figures.			
		No. of places where records were examined.	Percentages.			No. of places where records were examined.	Percentages.		
			Hospital isolating.	Home isolating.	Hospital and Home.		Hospital isolating.	Home isolating.	Hospital and Home.
West Midland	Gloucester	12	66·6	25·0	8·3	12	41·7	58·3	—
	Hereford	1	100·0	—	—	8	12·5	50·0	37·5
	Salop	6	16·6	83·3	—	6	—	100·0	—
	Stafford	26	46·2	38·4	15·4	10	70·0	20·0	10·0
	Worcester	10	80·0	20·0	20·0	8	50·0	37·5	12·5
	Warwick	9	66·6	—	33·3	8	62·5	12·5	25·0
		64	53·1	31·3	15·6	52	42·3	44·2	13·5
North Midland	Rutland	1	100·0	—	—	1	100·0	—	—
	Leicester	6	33·3	66·6	—	5	40·0	60·0	—
	Lincs.	8	37·5	50·0	12·5	8	12·5	87·5	—
	Notts.	12	33·3	66·6	—	2	50·0	50·0	—
	Derby	14	64·3	14·3	21·4	11	72·7	27·3	—
		41	46·3	43·9	9·8	27	48·2	51·8	
North Western	Cheshire	29	72·4	17·2	10·3	12	66·6	16·7	16·7
	Lancs.	83	51·8	31·3	16·9	13	61·5	23·1	15·4
		112	57·1	27·7	15·2	25	64·0	20·0	16·0
Yorks	East Riding	8	37·5	50·0	12·5	4	100·0	—	—
	North ,,	10	50·0	40·0	10·0	9	11·1	88·9	—
	West ,,	65	90·8	7·7	1·5	22	86·4	4.5	9·1
		83	80·7	15·7	3·6	35	68·6	25·7	5·7
Northern	Durham	24	87·5	4·1	8·3	9	77·8	—	22·2
	Northumberland	10	50·0	30·0	20·0	5	—	60·0	40·0
	Cumberland	12	66·6	33·3	—	5	40·0	20·0	40·0
	Westmorland	7	85·7	—	14·3	3	100·0	—	—
		53	75·5	15·1	9·4	22	54·6	18·2	27·3
Wales		49	30·6	69·4	—	34	14·7	85·3	—

In the abbreviated table above it may first be noticed that only in the South Western, North Midland and North Western divisions is the percentage of hospital-isolating districts greater

in the rural than in the urban areas. Next, it will be seen that the Yorkshire Division, as regards both urban and rural areas, contains the greatest percentage of hospital-isolating districts, though the South Eastern division is about the same as Yorkshire in respect of urban areas. At the other end of the scale come, in order, the North Midland, the South Western and Wales, in all of which divisions the majority of urban areas are not hospital-isolating. In respect of their rural areas the three Northern divisions and the South Eastern division all contain over 50 per cent. of hospital-isolating districts; in Wales 85 per cent. of the country districts are home-isolating, while in the other divisions there is not much difference between the numbers which isolate at home and those which isolate in hospital.

If, in the same table, the examination be now directed to the counties of England and to those only from which 25 or more district returns (from urban and rural districts together) were sent, it will be seen that they arrange themselves in the following order as regards the percentage of their urban districts which are hospital-isolating.

County.	*Percentage of hospital-isolating urban districts.*
London	100·0
Surrey	95·8
Kent	90·9
Yorks, W. Riding	90·8
Middlesex	88·5
Durham	87·5
Essex	84·6
Southants	83·3
Cheshire	72·4
Derby	64·3
Sussex	55·0
Lancs	51·8
Staffs	46·2
Devon	41·2

A feature in this list is the high hospital-isolating rate of London and all its neighbouring counties and the comparatively low position occupied by the industrial counties of Lancashire and Staffordshire.

In 19 of the counties the percentage of home-isolating rural districts is 50 or over; in Cornwall, Shropshire, Leicestershire, Lincolnshire and Notts a preponderance of both urban and rural districts are home-isolating. The towns and districts with a high hospital-isolating rate are enumerated in Table 56 below.

Table 56.

Hospital-Isolating Districts.

List of larger Districts in which, during recent years, the Hospital-isolating rate has been 80 per cent. and over.

County.	County Boroughs.	Urban Districts.	Rural Districts.
London	All Metropolitan Boroughs		
Bedfordshire			Bedford
Berks		Maidenhead	
Bucks			Wycombe
Cheshire	Chester		
Derby		Buxton	
Devon	Plymouth		
Dorset			Poole
Durham	Darlington	Felling	Lanchester
		Hebburn	
		Jarrow	
		Stockton-on-Tees	
Essex		Clacton	Romford
		Colchester	
Gloucestershire		Cheltenham	Stroud
Hants	Bournemouth	Aldershot	Whitchurch
		Eastleigh	Winchester
		Gosport	
		Winchester	
Herefordshire		Hereford	
Hertfordshire		Watford	
Kent		Bromley	Dartford
		Erith	Faversham
		Maidstone	
		Margate	
		Rochester	
		R. Tunbridge Wells	
		Sittingbourne	
Lancashire	Blackburn	Ashton-in-Makerfield	Chorley
	Blackpool	Thornton	
	Liverpool	Walton-le-Dale	
	Manchester		
	St. Helens		
	Warrington		
Lincolnshire		Bourne	
Middlesex		Brentford	
		Ealing	
		Edmonton	
		Hayes	
		Heston and Isleworth	
		Twickenham	
		Uxbridge	
Norfolk	Norwich	Cromer	
Northumberland		Wallsend	
Notts		Mansfield	

County.	County Boroughs.	Urban Districts.	Rural Districts.
Staffs.	Burton-on-Trent	Wolstanton United	Cheadle
	Stoke-on-Trent		
	Wolverhampton		
Suffolk	Ipswich	Lowestoft	
		Newmarket	
Surrey	Croydon	Barnes	Epsom
		Egham	Godstone
		Esher and the Dittons	
		Farnham	
		Guildford	
		Merton and Morden	
		Surbiton	
		Sutton	
		The Maldens and Coombe	
Sussex	Brighton	Bognor	
	Eastbourne	Chichester	
	Hastings		
	Hove		
Warwickshire		R. Leamington Spa	
Westmorland			Westmorlard C.D.
Wight, Isle of			Isle of Wight
Wilts		Salisbury	
		Swindon	
Worcestershire		Malvern	Feckenham
		Redditch	Pershore
Yorks, E.R.			Howden
Yorks, N.R.	Middlesbrough		
Yorks, W.R.	Barnsley	Ardsley E. & W	Doncaster
	Bradford	Batley	Rotherham
	Dewsbury	Brighouse	Wakefield
	Leeds	Castleford	Wortley
	Rotherham	Doncaster	
	Sheffield	Heckmondwike	
	Wakefield	Keighley	
		Morley	
		Pontefract	
		Rawmarsh	
		Rothwell	
		Shipley	
		Wombwell	
		Worsborough	
Wales	Cardiff		
	Merthyr Tydfil		

Probing the matter further, until individual districts and towns are reached, it will be discovered that the hospital-isolating rate seems generally to be high among the thickly populated industrial towns. Thus in Table 55, on page 159, it is shown what a large proportion of scarlet fever patients in London are removed to hospital. In Table 57 below, also, it will be seen that—with very

few exceptions—the hospital-isolating rate during the last 10 years has been very high in the 36 largest cities from which information is available. It may be noted that, together, London and these 36 large cities, where from 85 to 95 per cent. of scarlet fever cases are treated in hospital, contain just about one-quarter of the total English population.

TABLE 57.

HIGH HOSPITAL-ISOLATING RATE IN LARGE TOWNS.

Gives percentages of Notified Cases admitted to Hospital during the years 1914–1923 *in towns of England and Wales with a Population of* 100,000 *and over.*

Town.	Period under review.									
	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923
Birmingham ..	71	71	74	79	77	77	65	61	64	68
Liverpool	82	84	83	79	84	79	82	81	83	—
Manchester ..	48	80	76	80	78	68	60	54	65	—
Sheffield	76	82	87	78	90	86	83	91	89	—
Leeds	90	91	90	91	86	93	91	90	86	89
Bristol	57	55	73	65	73	68	50	36	53	—
West Ham ..	66	78	79	65	48	57	35	65	79	78
Hull	Average for 10 years (1912–21) = 60%									
Bradford	—	—	—	—	—	—	—	84	87	88
Newcastle-on-Tyne	81	91	94	91	99	88	85	82	85	88
Stoke-on-Trent ..	80	79	84	84	87	82	86	91	88	92
Nottingham ..	62	47	58	56	69	60	62	59	65	74
Portsmouth ..	67	71	79	77	77	91	86	51	74	—
Leicester	66	65	62	72	67	72	70	66	74	—
Cardiff	43	84	87	90	94	50	74	83	89	80
Plymouth	68	75	80	85	78	82	85	89	87	90
Croydon	84	87	88	87	93	83	83	83	87	88
Bolton	52	48	58	58	50	49	48	51	53	58
Sunderland ..	Average for 10 years (1912–21) = 83 %									
Oldham	64	68	73	76	75	67	73	69	76	79
East Ham	74	81	91	83	87	76	51	49	79	81
Brighton	89	91	86	88	82	78	86	63	74	83
Middlesbrough ..	—	—	94	97	94	92	93	84	93	—
Derby	62	55	80	73	73	83	62	66	74	74
Coventry	80	81	79	78	77	62	63	92	76	78
Blackburn	79	78	66	71	81	77	91	81	80	79
Gateshead	63	66	60	52	36	53	54	67	80	58
Stockport	77	82	83	74	82	69	67	69	70	73
Norwich	58	81	88	87	91	75	90	82	80	81
South Shields ..	70	72	82	75	78	59	75	72	71	84
Preston ..	Average for 10 years (1912–21) = 48 %									
Southend	83	81	91	89	84	68	78	74	76	68
Burnley	51	56	54	61	50	35	51	55	60	42
St. Helens	87	98	97	96	92	99	97	99	97	97
Wolverhampton ..	85	85	83	85	87	90	91	83	91	92

A high hospital-isolating rate, however, is not exclusively found in thickly populated industrial towns.

Thus in Table 58 below are shown, set out in order of population, those towns (other than Boroughs) which come within the Registrar-General's 20,000 to 15,000 population group.

TABLE 58.

Shows that a HIGH HOSPITAL-ISOLATING RATE *also obtains in certain* SMALL TOWNS.

Town.	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923
Willenhall			Home-isolating.							
Darlaston			21	57	92	71	45	71	66	55
Surbiton	87	97	93	88	81	84	86	84	93	97
Merton & Morden ..	82	69	100	100	78	80	100	78	82	83
Harrow-on-the-Hill	87	85	78	90	77	95	78	64	72	55
Friern Barnet ..	83	76	66	90	63	70	69	93	82	62
Wombwell	82	24	60	93	7	21	78	86	84	98
Newton-in-Makerfield	84	73	84	74	79	93	87	73	80	82
Carlton			Home-isolating.							
Malvern	91	97	95	100	100	100	60	98	98	100
Denton			Home-isolating.							
Kirkby-in-Ashfield			Home-isolating.							
Clacton	87	100	94	100	100	76	100	100	100	100
Brentford	89	96	100	100	94	93	97	91	99	97
Wembley	52	41	85	11	77	43	55	67	62	60
Failsworth			Home-isolating.							
Seaham Harbour ..	33	9	57	21	28	38	42	67	44	50
Chester-le-Street ..	46	53	83	54	60	55	77	89	74	96
Hucknall			Home-isolating.							
Redditch	94	83	100	100	100	100	100	100	98	86
Eastleigh	80	92	90	100	100	92	95	85	100	94
Ramsbottom ..	36	56	56	56	70	78	57	72	74	83
Wanstead		65	18	73	50	65	73	44	72	62
Oswaldtwistle ..			Home-isolating.							

It will be noticed that many of the small towns in this list have a high hospital-isolating rate, the figures for Merton and Morden, Surbiton and Redditch exceed, indeed, any of those given for the large metropolitan boroughs and great towns. At the same time it will be noticed that in this list are included six towns where home-isolation is the rule rather than hospital isolation.

A high hospital-isolating rate is almost universal, also, in the popular seaside towns and other holiday resorts as shown in Table 59 below. In a note on the subject of hospital isolation Dr. Edwards (Bournemouth) states: "Even now we isolate 90 per cent. I have continued this practice on account of the special circumstances of a health resort and not because I hold the opinion that such a high degree of hospital isolation is necessary to prevent the spread of infection."

TABLE 59.

Shows the HIGH HOSPITAL-ISOLATING RATE *in certain Seaside Towns and* HOLIDAY RESORTS.

Town.	Period under review.									
	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923
Bath	70	80	72	78	72	83	81	60	76	81
Bexhill	84	87	82	78	83	75	63	64	42	100
Blackpool	90	93	87	90	95	89	—	—	—	—
Bognor	60	78	80	—	20	40	50	84	83	89
Bournemouth ..	97	85	94	92	94	89	80	81	93	
Brighton	89	91	87	88	82	78	86	63	74	
Buxton	97	88	100	100	100	100	100	100	94	90
Cheltenham ..	86	91	90	94	96	100	90	83	88	86
Clacton	87	100	94	100	100	76	100	100	100	100
Eastbourne.. ..	99	99	96	100	100	99	98	100	97	93
Folkestone	Average of 83 % 1912–1921.									
Harrogate	91	77	76	90	77	88	83	71	73	81
Hastings	80	87	94	93	83	88	82	90	93	92
Hove	80	74	90	100	81	68	89	74	89	
Leamington ..	93	93	70	95	94	92	98	62	90	93
Llandudno	94 % average for 10 years .									
Margate	82	85	83	92	80	77	89	75	81	90
Plymouth	68	75	80	85	78	82	85	89	87	90
Ramsgate	95	74	64	66	70	86	92	80	81	95
Rhyl	66	100	100	100	100	90	82	80	95	79
Scarborough ..	85	85	77	100	76	72	77	75	81	61
Southend	83	81	91	89	84	68	78	74	76	68
Surbiton	87	97	93	88	81	84	86	84	93	97
Torquay	74	86	78	71	83	90	85	100	86	92
Tunbridge Wells ..	90	100	93	92	88	98	100	97	98	94
Whitby	75	93	95	94	94	93	100	100	100	95
Worthing	82	63	61	91	52	91	75	70	72	71

In contrast with those places in which the majority of scarlet fever patients are treated in hospital (provided the resources of the hospital are not exceeded, as in epidemic times) are towns and districts where home-isolation is the rule. Such a rule is, of course, inevitable where no convenient hospital exists, but in the list of places given below in Table 60 the statistics show that the majority of patients are treated at home in spite of existing hospital facilities. This list is not exhaustive, for it is virtually restricted to places which retain 60 per cent. or more of the notified cases at home and where 100 or more cases have been notified during the ten years, 1914 to 1923.

Table 60.

Home-Isolating Districts.

List of Districts (excluding those where no Hospital facilities are said to exist) where, during the ten years 1914–1923, 60 *per cent. and over of the total number of cases notified during that time have been treated at Home; districts in which less than* 100 *cases have been notified in the period are not included.*

District and County.	Population: census 1921.	Total no. of cases notified 1914–1923 incl.	Remarks.
Berks.			
*Easthampstead R.D.	18,751	—	
*Wokingham R.D. ..	18,468	—	
*Bradfield R.D. ..	14,560	—	
Bucks.			
*Newport Pagnell U. and R.D.	18,897	295	
†Buckingham R.D. ..	7,435	111	
Cambs.			
Linton R.D.	9,925	151	
Cheshire.			
†Ashton-upon-Mersey U.D.	7,780	136	7 years.
*Bredbury and Romiley U.D.	9,169	269	
Cheadle and Gatley U.D.	11,036	315	
Hazel Grove and Bramhall U.D.	10,125	223	
Stalybridge U.D. ..	25,233	504	
Cornwall.			
Ludgvan Madron U.D. Paul U.D. W. Penrith R.D. } C.D.*	21,263	—	100 per cent. treated at home.
Camborne U.D. ..	14,582	503	
Redruth R.D. ..	16,791	90	6 years.
Cumberland.			
Maryport U.D. ..	10,895	—	100 per cent. treated at home.
Derby.			
Heanor U.D.	21,438	788	
*Bakewell R.D. ..	20,330	412	

District and County.	Population : census 1921.	Total no. of cases notified 1914–1923 incl.	Remarks.
Devon.			
*Dartmouth M.B. ..	7,201	168	
Barnstaple M.B. ..	14,409	283	
†Okehampton U. and R.D.	16,928	190	
Plympton St. Mary R.D.	21,660	423	
Durham.			
Bishop Auckland U.D.	14,294	465	
Essex.			
Lexden and Winstree R.D.	19,475	257	
Gloucester.			
Chipping Sodbury R.D.	21,096	—	
Dursley R.D. ..	12,557	—	
Gloucester R.D. ..	13,116	—	
Thornbury R.D. ..	18,853	—	
Wheatenhurst R.D. ..	6,146	—	
Hereford.			
Dore R.D.	6,255	—	
Leominster R.D. ..	7,595	—	100 per cent. treated at home.
Kent.			
†Northfleet U.D. ..	15,719	288	
Lancs.			
Accrington M.B. ..	43,610	—	
Ashton-under-Lyne M.B.	43,333	—	
†Audenshaw U.D. ..	7,878	—	
†Bacup M.B. ..	21,256	—	
Chadderton U.D. ..	28,730	988	
Church U.D.	6,751	—	
Clayton-le-Moors U.D.	8,559	90	
†Colne M.B.	24,755	562	
†Denton U.D. ..	17,631	642	
Droylsden U.D. ..	13,877	455	
Eccles M.B.	44,237	1,670	
Failsworth U.D. ..	16,972	684	
Heywood M.B. ..	26,691	781	
Irlam U.D.	9,471	224	
†Little Lever U.D. ..	4,807	182	
Nelson M.B.	39,839	921	
†Oswaldtwistle U.D.	15,107	331	
Rawtenstall U.D. ..	28,381	394	
†Swinton and Pendlebury U.D.	30,924	1,499	

District and County.	Population: census 1921.	Total no. of cases notified 1914–1923 incl.	Remarks.
Upholland U.D. ..	5,532	303	100 per cent. treated at home.
Worsley U.D. ..	13,929	482	9 years.
*†Standish U. and Wigan R.D. ..	7,294 6,296	316 168	
Barton-on-Irwell R.D.	10,110	249	5 years.
Burnley R.D. ..	19,208	302	
Warrington R.D. ..	12,124	380	
Leicester.			
Coalville U.D. ..	20,468	510	
*Loughborough M.B.	25,874	480	
*†Market Harborough U.D.	8,577	206	
Shepshed U.D. ..	5,536	158	
Ashby-de-la-Zouch R.D.	17,060	246	
Lincs.			
Cleethorpes U.D. ..	28,160	396	
Grantham M.B. ..	18,902	261	100 per cent. treated at home.
Scunthorpe and Frodingham U.D.	27,354	315	3 years.
Spalding U.D. ..	10,702	110	
*†Branston R.D. ..	13,673	201	
Gainsborough R.D.	14,341	181	8 years.
Grantham R.D. ..	12,006	122	100 per cent. treated at home.
Louth R.D.	17,477	200	
Spilsby R.D.	21,792	228	
*Welton R.D. ..	10,937	123	
Middlesex.			
Teddington U.D. ..	21,216	350	
†Tottenham U.D. ..	146,695	5,413	Since 1922 only.
†Wealdstone U.D. ..	13,439	389	
Norfolk.			
*Downham U. and R.D.	16,978	346	
*King's Lynn U.D. ..	19,968	966	
Marshland R.D. ..	15,599	323	
Northants.			
Desborough U.D. ..	4,108	145	
*Northampton R.D...	7,357	110	
Northumberland.			
Bedlingtonshire U.D.	26,417	749	
*Blyth M.B.	31,833	1,132	
*Rothbury U. and R.D.	6,736	149	

District and County.	Population: census 1921.	Total no. of cases notified 1914–1923 incl.	Remarks.
Northumberland—cont.			
Alnwick R.D. ..	14,368	110	5 years.
Castle Ward R.D. ..	13,136	645	
Hexham R.D. ..	24,450	677	
Norham and Islandshires R.D.	5,994	121	
Notts.			
Arnold U.D.	11,800	307	
Carlton U.D. ..	18,511	548	
†Hucknall U.D. ..	16,835	399	
Mansfield Woodhouse U.D.	13,465	370	
†West Bridgford U.D.	13,352	283	
Stapleford R.D. ..	11,516	112	
Oxford.			
*N. Oxford C.D. ..	56,403	981	
Peterborough.			
Peterborough R.D. ..	9,508	150	141 treated at home.
Salop.			
*N.E. Salop C.D. ..	85,037	1,101	
Somerset.			
†Burnham on Sea U.D.	5,569	67	
†Bridgwater R.D. ..	17,465	211	
†Frome R.D. ..	10,853	124	
Southampton.			
*Christchurch M.B. ..	6,991	114	
*Romsey U.D. ..	4,826	134	
Droxford R.D. ..	12,965	160	
*Romsey R.D. ..	7,070	88	
South Stoneham R.D.	12,353	285	
Staffs.			
†Brownhills U.D. ..	18,241	567	
Cannock U.D. ..	32,930	864	
Quarry Bank U.D. ..	7,824	205	
Rowley Regis U.D. ..	40,037	810	
Rugeley U.D.	4,607	119	
*Short Heath U.D. ..	4,474	225	100 per cent treated at home.
*Uttoxeter U. and R.D.	13,666	202	
Wednesbury M.B. ..	30,407	443	
*Willenhall U.D. ..	19,671	512	
Walsall C.B.	96,964	1,753	
Suffolk E.			
Blything R.D. ..	17,853	308	
Hartismere R.D. ..	10,840	225	

District and County.	Population: census 1921.	Total no. of cases notified 1914–1923 incl.	Remarks.
Suffolk, E.—cont.			
Hoxne R.D.	9,634	180	
Woodbridge R.D. ..	16,048	147	
Sussex E.			
*Portslade U.D. ..	7,696	199	
*Midhurst R.D. ..	14,795	161	
*Uckfield R.D. ..	26,764	198	
*Westbourne R.D. ..	8,986	184	
Worcestershire.			
Dudley C.B.	55,908	1,056	
Martley R.D. ..	12,479	181	
Yorks E.R.			
Beverley U.D. ..	13,469	205	
Yorks N.R.			
*Loftus U.D. ..	9,012	340	
*Skelton and Brotton U.D.	15,653	474	
*Easingwold R.D. ..	9,965	187	
*Guisborough R.D. ..	8,271	315	
†Northallerton R.D...	7,635	115	
Brecknock.			
*Brecknock U.D. ..	5,649	106	
Vaynor and Penderyn R.D.	5,672	114	5 years.
Carmarthen.			
Llanelly U.D. ..	36,504	1,105	
Glamorgan.			
Aberdare U.D. ..	55,010	2,384	
*Bridgend U. and Penybont R.	36,915	1,710	
Mountain Ash U.D. ..	43,292	2,650	
Ogmore and Garw U.D.	30,178	1,104	5 years.
Pontypridd U.D. ..	47,171	1,331	
Cowbridge R.D. ..	9,717	134	8 years.
Monmouth.			
Abercarn U.D. ..	20,123	569	100 per cent. treated at home.
†Abertillery U.D. ..	38,805	1,821	
Bedwas and Machen U.D.	8,487	302	
Ebbw Vale U.D. ..	35,383	1,068	4 years.
*Panteg U.D. ..	10,984	442	
*Pontypool U.D. ..	6,883	230	
*Risca U.D.	16,746	1,484	

District and County.	Population: census 1921.	Total no. of cases notified 1914–1923 incl.	Remarks.
Monmouth—contd.			
Rhymney U.D. ..	11,691	475	
*St. Mellons R.D. ..	11,506	356	
Montgomery	—	—	
*Llanfyllin R.D. ..	12,145	138	

* The period in this case is 1911–1921 inclusive, and the population a mean one for this period.

† Signifies a place where the Milne treatment has been, or is being, practised.

The list above comprises the County Boroughs of Walsall and Dudley; the Municipal Boroughs of Accrington, Ashton-under-Lyne, Bacup, Barnstaple, Blyth, Colne, Dartmouth, Grantham, Nelson and Wednesbury; 70 Urban Districts; 51 Rural and 4 Combined Districts. The great majority of the districts and towns are small, but those with a population of 25,000 and over are enumerated below for easy reference.

TABLE 61.

Towns of 25,000 *inhabitants and over, in which* HOME-TREATMENT *is largely carried out.*

District or Town.	Character.	Population.	Total no. of cases notified 1914–1923	Percentage treated at home during 1914–1923
Tottenham U.D. ..	"London dormitory for the working classes."	146,711	5,413	46
Walsall C.B. ..	Industrial ..	96,964	1,753	98
N. E. Salop C.D. ..	Agricultural mainly	85,037	1,101	100
N. Oxford C.D. ..	Residential and agricultural.	57,998	981	80
Dudley C.B. ..	Industrial and mining.	55,908	1,056	100
Aberdare U.D. ..	Mining	55,010	2,384	70
Pontypridd U.D.	,, ...	47,171	1,331	82
Eccles M.B. ..	Industrial and residential.	44,237	1,670	77
Ashton-under-Lyne M.B.	Industrial ..	43,333	1,209	62
Accrington M.B. ..	,,	43,610	698	80
Mountain Ash U.D.	Mining	43,292	2,650	70
Rowley Regis U.D.	Industrial and mining.	40,037	810	99
Nelson M.B. ..	Industrial ..	39,839	921	93
Abertillery U.D. ..	Mining, industrial	38,805	1,821	83

District or Town.	Character.	Population.	Total no. of cases notified 1914–1923	Percentage treated at home during 1914–1923
Bridgend U. and Penybont R.D.	Residential ..	36,915	1,710	65
Llanelly U.D. ..	Industrial ..	36,504	1,105	93
Ebbw Vale U.D. ..	Industrial, mining	35,383	1,068	98
Cannock U.D. ..	Mining	32,930	864	92
Blyth M.B. ..	Industrial, mining	31,833	1,132	78
Swinton and Pendlebury U.D.	,, ,,	30,924	1,499	65
Wednesbury M.B.	,, ,,	30,407	443	98
Chadderton U.D.	Industrial ..	28,730	988	64
Rawtenstall U.D.	,,	28,381	394	94
Cleethorpes U.D...	Residential ..	28,160	396	84
Uckfield R.D. ..	Residential, agricultural.	26,764	198	85
Heywood M.B. ..	Industrial ..	26,691	781	61
Stalybridge U.D.	,, ..	25,233	504	93

It has previously been mentioned that the home-isolating districts are chiefly to be found in Wales, the North Midlands and the South Western division; the English counties in those divisions which contribute the majority of home-isolating districts being Cornwall, Leicester, Lincs. and Notts. Shropshire, also, is almost entirely a home-isolating county; while in respect of either their urban or their rural districts Oxford, Gloucester, Suffolk and Norfolk contain a comparatively large number of districts where cases are treated at home. Contrary to what might, perhaps, be expected, Lancashire's percentage of home-treating urban districts is no higher than 51·6; so that, broadly speaking, the home-isolating districts are disposed in three main parts of the country: the west side of England with Wales, the three eastern counties between the Humber and the Stour, and a smaller area in the Midlands.

The next noticeable thing about the lists of home-isolating districts is that they contain a large proportion of the districts in which some form of Milne treatment has been, or is at present being carried out.*

Reverting to Table 61, containing the larger home-isolating towns, it will be seen that nearly all these towns are classed as industrial, the exceptions being the combined districts of Oxford and Shropshire and the urban districts of Bridgend and Cleethorpes. The most notable, perhaps, are Walsall, Dudley and Tottenham, more especially as each of these places is surrounded by hospital-isolating districts. The incidence, fatality and return-case rates in these three towns are set out below, and compared with similar rates for contiguous hospital-isolating towns.

* For a review of the Milne treatment see Appendix M.

Table 62.

Certain Home-isolating and Hospital-isolating Towns compared.

Tottenham, Walsall and Dudley: A comparison between the incidence, fatality and return case-rates of these home-isolating towns with similar rates in neighbouring towns where hospital isolation is the rule.

Town.	Population. (1921)	Total no. of cases notified 1921–3.	Attack-rate per 1,000.			HOSPITAL.									HOME.								
						Percentage sent to hosp.			Case-mortality.			Return case-rate.			Percentage kept at home.			Case-mortality.			Return case-rate.		
			1921	1922	1923	1921	1922	1923	1921	1922	1923	1921	1922	1923	1921	1922	1923	1921	1922	1923	1921	1922	1923
Tottenham ..	146,711	2,366	*7·2*	*6·1*	*2·5*	*47·0*	*23·0*	*9·3*	*1·4*	*2·3*	*5·5*	No rec	*6·1*	*8·3*	*53·0*	*77·0*	*90·7*	No rec	*0·1**	*0·2†*	No rec	*8·2*	*9·4*
Edmonton ..	66,807	797	6·3	3·8	1·7	98·6	91·8	88·8	0·5	1·3	–	2·9	6·3	11·6	1·4	8·2	1·2	–	–	–	–	–	–
Enfield	60,743	451	3·6	2·4	1·3	72·0	79·2	79·7	Nil	0·8	1·5	5·7	20·3	4·4	27·9	20·7	20·2	Nil	Nil	5·8	–	–	–
Hornsey ..	87,691	1,003	6·7	3·2	1·4	55·7	70·3	79·4	Nil	0·5	1·0	3·7	3·0	6·0	44·3	29·7	20·6	1·6	1·1	Nil	No information.		
Walsall	96,926	425	*1·4*	*1·2*	*1·6*	*6·3*	*2·5*	*3·0*	Nil	Nil	Nil	Nil	Nil	Nil	*93·6*	*97·4*	*96·9*	*0·7*	*0·8*	*1·2*	Nil	Nil	Nil
Wolverhampton	104,000	922	3·7	3·2	1·8	83·0	91·0	92·0	2·2	1·6	1·1	Nil	7·1	3·4	17·0	9·0	8·0	Nil	3·2	Nil	No information.		
Stafford	29,080	237	2·7	2·0	3·4	96·2	100·0	92·1	Nil	1·7	Nil	No	rec.	3·2	3·8	Nil	7·9	Nil	Nil	Nil	No rec		12·5 (1 case)
Dudley	57,100	319	*2·1*	*2·1*	*1·3*	All home treated									*100·0*	*100·0*	*100·0*	*4·1*	Nil	*2·5*	Nil	*0·8*	Nil
Redditch ..	16,530	402	0·5	16·3	7·1	100·0	98·5	86·4	Nil	1·1	3·9	Nil	3·5‡	5·8‡	Nil	1·5	13·6	Nil	Nil	Nil	No rec	Nil	Nil
Kidderminster ..	27,118	284	14·0	6·7	2·3	89·4	84·6	79·3	Nil	Nil	Nil	2·6	1·9	4·0	10·6	15·4	20·7	Nil	Nil	Nil	Nil	Nil	Nil

* The only death among home-treated cases occurred before Milne treatment was commenced.

† One death only among home-treated cases. Milne treatment was refused in this case.

From the table above it appears that the home-isolating towns, and Walsall in particular, compare not unfavourably with the hospital-isolating towns. As regards attack-rate, Tottenham fares badly in comparison with all its neighbours, while Walsall and Dudley have better records than their neighbours. In the matter of case-mortality the rates for Tottenham's home-treated cases are better than its neighbours' hospital-fatality rates; a similar comparison finds Walsall on the whole better than Wolverhampton, better than Stafford for 1922, but worse for 1921 and 1923; Dudley in respect of 1922 and 1923 has better figures than Redditch, but worse figures than Kidderminster, except for 1922, when there were no deaths in either town.

A comparison of the return case-rates on the same basis (*i.e.* home-treated cases for Tottenham, Walsall and Dudley and hospital cases for the other towns) shows that Tottenham for the whole compares unfavourably with the other towns in the district, though Edmonton in 1923, and Enfield in 1922, record rates of 11·6 and 20·3, which exceed Tottenham's highest figure of 9·4 in 1923. Walsall and Dudley, on the other hand, compare favourably with the other towns in their respective groups.

3. Arguments Advanced in Favour of Hospital Treatment.

The circumstances under which Medical Officers of Health consider it advisable or imperative to remove cases of scarlet fever to hospital were discussed on page 49; but it may be mentioned here again that the circumstances most frequently mentioned are: insufficient facilities for isolation in the home, the presence of other children in the patient's house, domestic overcrowding, and the difficulty in securing suitable nursing. Other circumstances less frequently mentioned are also catalogued on page 50, but it it is clear that the unsatisfactory social and economic conditions of the average home in which scarlet fever appears furnishes the chief argument with many reporters for hospital isolation and treatment, both in town and country districts. There is some sanction, indeed, for grouping all the preferences for hospital treatment into three divisions—(i) those on account of the *parent*, (ii) those on account of the *public*, (iii) those on account of the *patient*.

In not a few answers stress is laid upon the general advantages which the child gains by its sojourn in the isolation hospital.

The medical advantages that the child as a patient derives from hospital treatment were discussed in the analysis of Question 3 (*c*) and (*d*) on page 31, *et seq*. There it was shown that opinion—among those who offered it—was nearly equally divided on the question of whether the hospital treatment of scarlet fever was responsible or not for the present greatly reduced case-mortality of the disease; but it is significant that 33 per cent. of the reporters are silent on the subject. Possibly the numbers of those who consider that the case-mortality has declined because of the

lessened virulence of the disease is greater than the number who say so. In any case the number of scarlet fever patients who die in these days is so small that, as pointed out by several reporters, it is doubtful whether case-mortality figures afford any safe criteria for estimating the present advantages or disadvantages of hospital treatment.

As regards complications, only a minority (28 per cent.) of reporters as a whole consider that hospital treatment reduces the number of such, but among the medical officers of the 25 largest county boroughs there is a majority who think that the chance of complications is reduced by treatment in hospital.

The extent to which hospital isolation is thought to have benefited the *public* may be partly gauged from the answers to Question 3 (*a*), which are analysed on page 32. There it will be seen that in the opinion of most of the reporters the prevalence of scarlet fever among the public has been diminished to some extent by the practice of hospital isolation.* This opinion, however, is not endorsed by the majority of those reporters whose experience is concerned with the largest districts and towns, such as the Metropolitan and larger County Boroughs, where hospital isolation has been extensively carried out for some years. Not a few reporters base their favourable opinion on the fact that in their districts the institution of hospital treatment has been *followed* by a lessened incidence.

Another argument used in favour of the contention that the spread of scarlet fever is minimised by hospital isolation is that secondary cases are less frequent in homes where patients have been removed to hospital than in those where they are nursed at home. In this connection, Dr. Greenwood's conclusions on p. 49 should be considered, and reference may also be made to the following tables submitted by Dr. Jolly (Wolverhampton) and by Dr. Kirkhope (Tottenham).

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* In this connection the following table sent in by Dr. Gibson (Guisborough C.D.) may be reproduced here.

Hospital cases.		Home cases.	
No. of households involved.	Secondary cases per 100 households.	No. of households involved.	Secondary cases per 100 households.
180	2·22	174	12·64

TABLE 63.

Wolverhampton: Shows the SECONDARY CASE-RATE *in respect of* HOSPITAL-TREATED AND HOME-TREATED CASES *of Scarlet Fever.*

Year.	Cases removed to hospital.	No. of houses in which a 2nd case arose.*	Cases nursed at home.	No. of houses in which a 2nd case arose.*
1895 ..	241	38 or 15·8%	27	15 or 55·6%
1896 ..	193	14 ,, 7·3%	26	8 ,, 30·8%
1897 ..	227	18 ,, 7·9%	39	17 ,, 43·6%
1898 ..	153	18 ,, 11·8%	25	5 ,, 20·0%
1899 ..	76	6 ,, 7·9%	10	3 ,, 30·0%
1900 ..	110	13 ,, 11·8%	14	6 ,, 42·9%
1901 ..	194	16 ,, 8·2%	42	11 ,, 26·2%
1902 ..	263	19 ,, 7·2%	33	14 ,, 42·4%
1903 ..	255	27 ,, 10·6%	32	10 ,, 31·3%
1904 ..	239	25 ,, 10·5%	29	7 ,, 24·1%
1905 ..	142	15 ,, 10·6%	24	4 ,, 16·7%
1906 ..	247	26 ,, 10·5%	30	5 ,, 16·7%
1907 ..	309	29 ,, 9·4%	29	6 ,, 20·7%
1908 ..	192	14 ,, 7·3%	25	4 ,, 16·0%
1909 ..	112	9 ,, 8·0%	13	3 ,, 23·1%
1910 ..	70	5 ,, 7·1%	8	2 ,, 25·0%
1911 ..	177	16 ,, 9·0%	21	5 ,, 23·8%
1912 ..	152	9 ,, 5·9%	10	1 ,, 10·0%
1913 ..	151	8 ,, 5·3%	9	1 ,, 11·1%
1914 ..	84	10 ,, 11·9%	4	1 ,, 25·0%
1915 ..	87	11 ,, 12·6%	8	1 ,, 12·5%
1916 ..	66	3 ,, 4·5%	2	—
1917 ..	156	15 ,, 9·6%	11	1 ,, 9·1%
1918 ..	94	10 ,, 10·6%	5	2 ,, 40·0%
1919 ..	90	7 ,, 7·8%	5	2 ,, 40·0%
1920 ..	146	9 ,, 6·2%	22	1 ,, 4·5%
Average ..	163	15 ,, 9·2%	19	5 ,, 26·8%

* The secondary cases in columns 3 and 5 include return cases.

In Dr. Kirkhope's list of " multiple cases " (Table 64) there is no distinction drawn between hospital and home-treated cases, but the records have reference to the years 1922–3–4–5, when the great majority of Tottenham cases have been treated at home under Milne methods.

TABLE 64.

Tottenham: MULTIPLE CASES *of Scarlet Fever during the years* 1922–5.

	1922.	1923.	1924.	1925.
No. occurring within 1 week after previous case	96	42	13	26
" " " 2 weeks " " "	14	16	6	5
" " " 3 " " " "	24	11	7	5
" " " 4 " " " "	12	6	—	5
" " " 5 " " " "	1	—	2	3
" " " 6 " " " "	1	—	—	2
" " " 7 " " " "	3	1	—	—
" " " 8 " " " "	—	—	1	—
" " " 9 " " " "	2	2	—	—
" " " 10 " " " "	—	—	—	1
" " " 11 " " " "	3	—	—	1
" " " 12 " " " "	—	—	—	—
" " " 13 " " " "	1	1	—	—
" " " 21 " " " "	—	1	—	—
Totals ..	157	80	29	49

4. REASONS GIVEN FOR THE PRACTICE OF HOME ISOLATION AND ARGUMENTS USED IN ITS FAVOUR.

The fact that a district has no convenient isolation hospital accounts for the adoption of home-treatment in the majority of non-hospital isolating districts. In these cases it is often the cost and trouble involved that determines the policy of home treatment in the case of a district like Okehampton, where the nearest isolation hospital is at Exeter, 25 miles away. Moreover, in such districts, generally rural ones, there is a natural disinclination on the part of parents to the removal of their children to distances that make visits of inquiry difficult and expensive. As an instance, Dr. Moreton says that he has great difficulty in persuading parents in the isolated portion of Flint (Overton R.D.) to send their children to the isolation hospital at Wrexham. In many of these districts the lack of hospital facilities is deplored by the Medical Officer of Health, but not in all. Dr. Young is content with his results in the Okehampton Urban and Rural Districts; Dr. Spiers (Diss) "under no circumstances" would admit cases to hospital, and here and there a reporter states that he has advised against the building of an isolation hospital as an unnecessary expense in these days.

Passing on to those districts and towns which at any rate are not geographically debarred from the advantages of isolation hospitals it may be said that *economy* in their case is one of the main motives for home rather than hospital isolation and treatment. In Tottenham the main considerations are the difficulties and the expense of securing sufficient hospital accommodation, and Dr. Kirkhope, in his Annual Report for 1922, states that on April 3rd, when his domiciliary policy started, there were 208

scarlet fever patients in hospital costing in the aggregate £126 12s. per diem.

In other districts, again, hospital isolation and treatment prove expensive, because so few cases are removed to such institutions, and the contributory charges levied on the district become, therefore, excessively high per case. Thus, at Coalville the sum paid to the Leicestershire Joint Isolation Hospitals Committee for the year ending March 31st, 1924, was £1,074 0s. 6d. During this period seven cases of infectious diseases were admitted to isolation hospitals and only one of these was a case of scarlet fever. The hospital treatment of this solitary patient, therefore, worked out at £153 8s. 8d. plus a maintenance charge of £5 19s. 3d.—a total cost of £159 7s. 11d. Other instances which may be quoted are those of Guiseley U.D., 4 cases at £356, and Newton-in-Makerfield, 42 cases at a cost of £1,891.

The arguments used in favour of home-isolation and treatment and against hospital-isolation and treatment may be again considered in their relationship to the *public*, the *parents* and the *patient*.

The influence of hospitals in preventing the spread of disease is considered by many reporters of experience to be negligible but this, of course, does not mean that such authorities consider that scarlet fever would be more suppressed if cases were treated at home. There are a considerable number, however, who think that hospitals fail to limit the spread of the disease either because of the missed cases and carriers or because patients are not received early enough to prevent their infecting others before admission. There is certainly evidence in the returns that the instances in which there has been a diminution in the local prevalence are not confined to hospital-isolating districts.

Beyond those cases previously mentioned where, partly in the parents' interest, cases are not admitted to distant hospitals, there is little, if any, evidence of opinion that home-treatment is popular with parents.

Nor is it argued by any that the patient as a child is better off when treated at home than when it is sent to hospital. But as regards the patient as a "case" the summary of the answers to Question 3 (*c* and *d*) shows that a very considerable number of reporters are, at least, not satisfied that hospital isolation has been responsible for the reduced fatality. In this connection may be quoted some figures supplied from Liverpool which show that for 5 out of the 7 years in which complete records are available the fatality among home-treated patients was less than that in hospital-treated patients. But it is probable that here, as elsewhere, the hospital admissions include most of the serious cases.

TABLE 65.

Liverpool: FATALITY-RATES *among Hospital- and Home-treated patients.*

Year.	Removed to hospital.			Not removed.		
	Cases.	Deaths.	Fatality rate.	Cases.	Deaths.	Fatality rate.
1916	1,783	46	2·5	365	13	3·8
1917	1,796	58	3·2	481	11	2·3
1918	2,536	97	3·8	484	28	5·7
1919	2,216	60	2·7	581	8	1·3
1920	2,633	63	2·4	597	5	0·9
1921	2,475	45	1·8	587	10	1·7
1922	2,005	39	1·9	414	2	0·5
1923 (6 months)	950	14	1·4	158	4	2·5
	16,394	422	2·57	3,667	81	2·21

A larger proportion still see no advantage in hospital isolation as regards the prevention of complications, while a few express the opinion that the likelihood and the occurrence of complications is increased by hospital isolation.

5. COMPARATIVE COSTS OF HOSPITAL AND HOME TREATMENT.

The answers to Question 9 are, perhaps, more difficult to analyse than any others in the whole questionnaire, and it is doubtful whether any very accurate comparisons can be made without a much more detailed enquiry into the special circumstances of each district. The main difficulty lies in the fact that it is not always clear what items are included, or excluded, when figures for the cost of home- or hospital-treatment are given.

(*a*) *Home-treatment Costs.*—It seems to be a fairly general rule that when a scarlet fever patient is treated at home there is no cost to the Council of the district concerned except in the matter of disinfection measures. Thus, at Bristol the cost of home-treatment is "entirely a private matter," while the cost to the Council of disinfection is estimated at 4s. 7d. per case. There are some 150 answers, indeed, in which it is stated that home treatment costs "nothing" or "nothing but cost of disinfectants," "a few shillings," etc. The cost of disinfection as shown in a previous analysis (page 131), varies according to several circumstances, including the method of disinfection adopted (steam disinfection is comparatively expensive), the situation of the patient's house, the social and sanitary conditions of the house, and other circumstances. Within restricted limits, therefore,

the quoted examples of home-treatment costs (where disinfection alone is considered) vary considerably—from such a sum as sixpence to figures like £2 5s. 10d. (Croston, Lancs.); £1 10s. (Friern Barnet); £1 3s. 6d. (Benfieldside, Durham); £1 (Dewsbury). In the case of Friern Barnet and Dewsbury it is stated that the costs are at present high owing to recent capital expenditure. It should be mentioned that many reporters in their answers state that the figures given are "approximate" or "average" figures.

But occasionally other items are included in the costs of home-treatment. Thus, in South Shields County Borough and Bourne Rural District (Lincs.) it is mentioned that grants are made to the educational authorities in respect of those contacts of home-treated patients who are kept away from school for several weeks; in Bourne the cost per case of home-treated patients in these circumstances is £1 10s. Then there are exceptional instances where grants towards treatment and maintenance are made: at New Windsor, for example, a grant of 10 to 15 shillings is made when cases are boarded out; when hospital accommodation is lacking, 30s. is paid to a "handy-woman" at Smethwick; compensation to the bread-winner and a grant towards medical expenses at Eastleigh; a subsidy of 10s. to 15s. at West Ham. In this connection may be noted here, also, the unusual expedients adopted at Willesden mentioned in the footnote on page 188. In some cases compensation is paid for the official destruction of clothing or other articles suspected of being infectious.

At Liverpool the cost per case is 7s. 6d., and this is said to include disinfection and staff; at Padiham the cost is 2d. per week plus 18s. for disinfection; at Market Harborough the ordinary cost is 5s., but if a nurse attends the cost becomes 25s. per case.

An analysis of 100 answers, in which single (and not limiting) figures of cost for home-treatment are given, and excluding those districts where any special nursing is included, shows that the average cost of home-treatment for these hundred districts works out at about 10s. per case.

The cost of home-treatment and isolation, however, is largely increased where any special method of treatment is employed, and it is usually the expenses of expert nursing that accounts for this. Chief among special methods of home-treatment mentioned in the questionnaires is the Milne treatment, to which reference will be made later.

(*b*) *Hospital-treatment Costs.*—Comparisons between one district and another are even more difficult in the case of hospital costs than they were in the case of home-treatment costs. In the first place it is the exception for any answer to contain a specification of the headings under which the charges are made up, and from internal evidence it cannot be determined whether any given figures include all the three official classes of expenses, viz.,

" structural," " establishment," and " patients."* In the second place, while some districts assess the cost at so much per case, others assess it at so much per day, week, month or year, and others, again, give figures without any reference ; correlation under these circumstances, and in the almost general omission of data regarding length of detention in hospital, is almost impossible. Some rough idea of the cost of hospital treatment is afforded by the figures of 55s. and £18, which represent the averages of crude figures given respectively by 122 districts, which assess charges in terms of weekly cost per head, and 50 districts which assess their charges at so much per case.

Besides the extreme variations in cost reported from various districts there are fluctuations also in individual districts according to the period under review and other circumstances. Yearly fluctuations are shown by the following examples :—

Croston U.D.	..	During 1914–1918 the cost per week was 35/-
		,, 1918–1922 ,, ,, ,, 52/6
		,, 1923 ,, ,, ,, 43/9
Farnworth U.D.	..	In 1921 the cost per case was £49
		,, 1922 ,, ,, ,, £22
		,, 1923 ,, ,, ,, £35
Padiham U.D.	..	,, 1921 the cost per week was 24/-
		,, 1922 ,, ,, ,, 16/-
		,, 1923 ,, ,, ,, 13/6

In several places there is reported to be a reduction on numbers : thus in Congleton U.D. the cost is 35s. per case when the hospital is full, but £3 3s. per case when only a few beds are occupied ; in Christchurch R.D. the cost for one case is £10, for two £15, and for three £20 ; in Northallerton U.D. the cost for one case only is £4 10s. per week, but when more than one case is under treatment the average cost per patient is £3 3s. In Crompton the usual charge of £2 2s. per week is reduced when the patient has exceeded a detention period of six weeks. In Wembley U.D. the maintenance cost per day is a shilling less for patients under 12 than it is for those over that age. In Colwyn Bay U.D. there are nominal charges for residents, special charges for visitors and free treatment for poor people.

As mentioned already, it is seldom that the answers show how the given costs of hospital treatment are composed, but the instances in which some indication of what such costs do, or do not, include are enumerated in the following table.

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* See Isolation Hospitals Act, 1893, 17 (1).

TABLE 66.

Gives information concerning the composition of HOSPITAL COSTS.

District.	Composition of costs.
Derby C.B.	£4 10s. a case, exclusive of structural and establishment charges.
Southwick-on-Wear U.D.	£900 for year ending 31.3.24 = amount of precepts paid to Joint Board for loan charges, standing charges and maintenance of patients.
Chingford U.D.	£2 3s. 9d. per week, exclusive of maintenance charge.
Bristol C.B.	£1 16s. 7d. per week for treatment.
Horwich U.D.	£7 9s. per week inclusive; 13s. 10½d. per week for "expenses."
Bury R.D.	£21 5s. a case, inclusive of establishment charges.
Market Harborough U.D.	15s. 9d. per day, plus proportion of £500 standing charges.
Mutford R.D.	11s. per week for food only.
Sutton Coldfield U.D. ..	£2 10s. per case per week, plus annual maintenance fee of £235.
Worthing M.B. (1924) ..	45s. 6d. a week, includes maintenance, loans, and all expenses.
Stourbridge U.D. ..	£4 10s. per case, plus establishment charges.
Ardsley, East and West U.D.	Makes an annual contribution to its I.D. Hospital, which includes cost of steam disinfection and involves a rate of 4d. in the pound.
Castleford U.D. ..	29s. (?) per case, excluding establishment charges.
Greasborough U.D. ..	£3 4s. 2d. per case per week, plus £6 18s. 10d. per week as "contribution to common fund."
Rotherham R.D. ..	£7 7s. per case, plus standing charges.
Thorne R.D.	£1 1s. per week for food.
Swansea R.D.	£6 13s. 8d. per week, including staff salaries.
Norton R.D., E. Yorks.	14s. per week, plus £250 for annual precept.
Tewkesbury U. and R.D.	£1 1s. for maintenance in hospital.
Melton Mowbray R.D. ..	15s. 9d. per week for maintenance.
Hexham R.D.	19s. per week, exclusive of administrative charges and transport of patients.
Beverley U.D.	£160 per annum to County Council for 3 beds, plus 15s. per case per week.
Pudsey U.D.	32s. per week for food, coal, nursing and rent.

Dr. F. A. Spreat sent in an unusually complete account of the costs of hospital isolation for patients in the Friern Barnet district, where arrangements for bed accommodation are made with adjoining authorities. Dr. Spreat's figures and notes are appended below.

A. Friern Barnet: Total COSTS OF HOSPITAL TREATMENT *for Cases of Infectious Disease (mainly of Scarlet Fever) from* 1899 *to* 1924.

April to March.	Amount.	Number of cases treated.
	£ s. d.	
1899–1900	30 5 0	21
1900–1901	164 5 0	30
1901–1902	476 6 0	40
1902–1903	428 9 0	20
1903–1904	439 3 0	37
1904–1905	441 5 0	24
1905–1906	352 19 0	16
1906–1907	212 6 0	18
1907–1908	650 4 11	44
1908–1909	1,431 5 6	71

Up to this date (1909) isolation hospital accommodation had been obtained where, when, and how possible, and the charges varied considerably according to the accommodation available. After this year an agreement with the Southgate Council assured Friern Barnet the use of 6 beds for £360 per annum whether they were used or not, and an additional charge for food and maintenance of the patients occupying the beds.

1909–1910	943 3 0	56
1910–1911	706 11 0	25
1911–1912	403 1 0	14
1912–1913	399 17 0	22
1913–1914	500 13 6	31
1914–1915	616 17 0	51
1915–1916	584 3 0	44
1916–1917	409 10 0	44
1917–1918	477 15 6	35
1918–1919	468 18 0	41

Owing to the greatly increased cost of living these amounts did not cover the expenditure involved and paid by the Southgate U.D.C. for the maintenance of the beds and other expenses and from this date patients' maintenance charges were increased 50 per cent. although the amount payable under agreement for retaining the beds remained the same.

1919–1920	683 16 0	40
1920–1921	884 11 0	56

Under the original agreement with Southgate 12 beds were to be provided as from 1920 at a cost of £720 per annum whether the beds were used or not.

1921–1922	873 10 0	92

It was soon found that the expenditure in maintaining the beds and treating the patients by the Southgate U.D.C. was much greater than Friern Barnet was paying and the agreement was modified, whereby the cost of living index figure controls to some extent the payments for food, etc., consumed by the patients.

1922–1923	1,100 1 10	54
1923–1924	964 15 0	20

Details of the total costs, arranged in three periods, are set out in Dr. Spreat's analysis below and it will be noticed that the cost-per-case-figure in the period 1913–1920 compares favourably with similar figures for the two preceding periods ; this is probably due to the fact that, in the 1913–1920 period, the retaining fee is spread over a greater number of patients and that these patients were not detained so long in hospital. In this connection Dr. Spreat adds a footnote to the effect that, in 100 cases (including some from Friern Barnet) treated by Milne methods, Dr. Ransome, at Southgate, had reduced the length of stay from 42 to 25 days.

B. Friern Barnet: Analysis of Hospital Charges *in the case of infectious diseases, principally Scarlet Fever.*

Previous to 1909.

Number of cases for 10 years		207
Hospital charges	£2,788	6s. 2d.
Average days in hospital		36
Average cost per case, per day		7s. 6d.
Average cost per case	£13	10s. 0d.

Period 1909–1913. The pre-war period after the agreement with Southgate.

Number of cases		143
Hospital charges	£2,174	0s. 0d.
Average days in hospital per case		50
Average cost per case, per day		6s. 1d.
Average cost per case	£15	4s. 0d.

Period 1913–1920. The war and post-war period after the agreement with Southgate.

Number of cases		262
Hospital charges	£3,659	7s. 0d.
Average days in hospital per case		42
Average cost per case, per day		6s. 3½d.
Average cost per case	£13	19s. 4d.

Dr. Spreat adds the following additional notes :—

C. Friern Barnet : Charges made by various Outside Hospitals for taking an Occasional Patient from Friern Barnet.

In 1913 Hornsey charged 7s. per day or £17 3s. for 49 days.

In 1915 Enfield and Edmonton Joint Hospital Board charged at the rate of 6s. 10d. per day or 19 guineas for a period of 57 days.

In 1918 Hornsey's charges had risen to 8s. 8½d. per day or a charge of £24 7s. for a period of 57 days.

In 1921 the London Fever Hospital charged at the rate of 9s. per day although the actual cost of each patient treated there was 16s. per day. In the same year Barnet Joint Hospital Board charged 12s. per day and the Enfield and Edmonton Hospital Board charged 10s. 6d. per day.

(*c*) *Costs of Home and Hospital Treatment Compared.*—There was one reporter who expressed the opinion that for his Wiltshire district " the hospital is cheaper." The answers of all the other

reporters, however, who give an opinion or furnish comparative figures of cost (about 80 did neither), show that in most places the cost of hospital isolation and treatment is considerably higher than that of home-treatment and isolation. The average difference between twelve consecutive districts, where the comparative cost of home and hospital treatment is stated in both respects as so much per case, is £22 ; and, as mentioned previously, while 10s. per case may be considered as a rough average of normal home-treatment costs (excluding those districts in which home-treatment is said to cost nothing), £18 per case may be taken to represent roughly the average cost of hospital treatment.

So far these comparative considerations have been confined mainly to districts where, as a rule, the majority of scarlet fever patients are sent to hospitals belonging to the district in question while the smaller proportion are treated at home under private management and with no expense to the local authority beyond the cost of disinfection. The cost per case is often very much higher, however, when the local authority of a district in which cases rarely occur contributes to a joint hospital scheme or has to make some arrangement with another authority for the reception of its patients ; while, as regards home-treated cases, the average cost is at once exceeded where any special method of treatment or nursing is carried out. Some examples of the high cost of hospital treatment under the conditions mentioned above were mentioned previously on page 181.

In other cases, however, it appears that the cost of hospital treatment is lessened if a local authority shares a hospital with other authorities. Thus Dr. A. G. Glass, in the copy of a report which he attached to the questionnaire relating to Farnworth Urban District, states that, from the information available from certain Lancashire districts, " it costs a local authority more to isolate cases in its own hospital than it does when the cases are sent to another hospital." *Dr. Glass, in a table which is reproduced in modified form, sets out the number of fever cases admitted to the Farnworth Isolation Hospital during the period 1914 to 1923 from Farnworth, Little Lever, Little Hulton and Kearsley, together with the contributory costs.

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* The Farnworth Isolation Hospital was closed down at the end of 1924. Since then cases of infectious disease occurring in the Farnworth U.D., and for which hospital isolation was considered necessary, have been sent either to Ladywell Sanatorium (Salford Corporation), or to Astley Sanatorium (Leigh Joint Hospital Board).

TABLE 67.

Farnworth Isolation Hospital: MAINTENANCE COSTS.

Year.	No. of cases of scarlet fever, diphtheria and enteric fever admitted to hospital.				Annual cost of maintenance for Farnworth cases only.	Amount contributed by other authorities.		
	F.	L.L.	L.H.	K.		L.L.	L.H.	K.
					£ s. d.	£ s. d.	£ s. d.	£ s. d.
1914	115	29	24	—	895 10 4	180 5 2	269 8 6	—
1915	97	—	3	—	1,030 19 1	218 13 3	276 13 2	—
1916	106	7	—	—	1,193 16 8	179 6 11	291 14 0	—
1917	39	4	—	—	1,295 10 8	199 2 3	10 2 2	—
1918	28	4	—	—	1,521 9 10	71 19 6	—	—
1919	47	—	—	—	1,374 10 1	61 13 0	—	—
1920	82	—	—	4	1,736 12 3	20 0 0	—	—
1921	45	—	—	8	2,205 7 0	20 0 0	—	109 5 2
1922	89	—	—	20	1,938 12 2	20 0 0	—	240 3 0
1923	67	1	—	17	2,305 13 11	20 0 0	—	348 0 0

Dr. Glass goes on to say :—

"It will be seen from this table that the cost to Farnworth of maintaining the hospital has progressively increased from £895 in 1914 to £2,305 in 1923. This increase is due in great measure to the increased cost of living generally. Another important fact, however, emerges, and that is the diminished contributions from outside districts. During the first five years of the period under review, Little Lever contributed £911, whilst during the last 5 years that district has only paid £20 a year—the retaining fee. Again, during the first four years Little Hulton contributed £847, after which no payment was made, that authority having ceased to send cases to Farnworth Hospital. As an offset to these losses Kearsley has contributed £697 during the last three years. The loss of revenue from outside sources has thrown upon Farnworth much of the increased cost of maintenance."

An explanation of the "diminished contribution" from Little Lever is given in Dr. J. S. Pickford's answers to Questions 7 and 9 of the questionnaire, which are as follows: "(7) Prior to 1914 the cost of hospital-treatment was so heavy, amounting to £250—£300 per annum (equal to a five-penny rate), that it was decided to give a deliberate trial to the eucalyptus treatment." "(9) . . . Since we commenced home treatment the total annual cost to the Council is under £30 per annum; this includes annual retaining fee of £20 paid to the hospital."

An attempt to ascertain the total cost of treating scarlet fever patients in certain hospitals administered by Joint Hospital Boards and Joint Hospital Committees was not very successful, owing chiefly to the fact that the charges for scarlet fever cases are not usually kept distinct from those for other diseases; all that can be concluded from the information received is that the average weekly total cost of treating scarlet fever cases in these hospitals is somewhere about £3 per patient.

Examples of the increased cost involved in special forms of home-treatment are best provided by those districts in which the Milne treatment is, or has been, used; it is in the answers from these districts, too, that the closest comparisons have been drawn between the respective costs of hospital and home-treatment.

TABLE 68.

COMPARATIVE COSTS *of Home-treatment and Hospital-treatment in Five Urban Districts where special methods of Home-treatment are being, or have been, employed.*

District.	Home treatment.		Hospital treatment.
	Method.	Cost.	Cost.
Tottenham U.D.	Milne method, somewhat modified (now in use).	Nurse's salary is £236 10s. per annum—£6 10s. for 10 days. Five patients per nurse = £1 6s. per patient; material about 2s. Total cost under 30s. per case.	10s. 3d. per diem for an average stay of 66 days = £33 16s. 6d. per case.
Heston and Isleworth U.D.	Milne treatment (modified) adopted temporarily in 1922.	For 10 cases, the cost of nurses and their travelling expenses, drugs, and all else totalled £23 13s. 5d. or £2 3s. 0d. per case.	£6 7s. per case.
Wealdstone U.D.	Milne treatment (modified) during period 1.10.21 to 1.10.22.	Average cost per case = £8 17s. Average duration of case = 39½ days.	Average cost per case = £28 13s. 3d. Average stay in hospital = 51½ days.
Chiswick U.D.	Milne treatment (modified) during 1914.	Approximately 10s. per case.	Approximately £20 per case.
Willesden U.D.	Home treatment under special circumstances,* cases under observation of Health Nurses.	Average 11s. 2d. per week.	Average £3 18s. 2d. per week.

* During the epidemic of 1921–22, "between 14th October, 1921 and 27th February, 1922, applications for the home expenses of 136 completed cases were dealt with. These cases were nursed at home for a total of 4,652 days. The total cost was £385 8s. 0d., being £129 5s. 0d., in respect of doctors' fees and £256 3s. 0d. in respect of extra maintenance expenses incurred. The average total cost per case per day was, therefore, 1s 8d. or, excluding doctors' bills, 1s. 1d. In 12 cases nursed at home for a total period of 332 days extra maintenance expenses were not asked for, only the doctors' bills being presented for payment. Excluding these cases the average extra cost of maintenance per case per day worked out at 1s. 2d. At that time the average total cost per day per patient in the Municipal Hospital was 11s. 2d."

PART III. SUMMARIES

A—Summary of Previous Analyses

(*It should be stated here that the following summaries* (*on p.* 189 *to p.* 217 *incl.*) *refer chiefly to the opinions, statements and statistics provided by those who filled in the questionnaire forms and whose answers have been analysed in Part II. The conclusions of the Committee upon the prime subjects of the enquiry are set out in Part IV; these conclusions are not wholly based upon the information which is summarised below*).

A—Opinions expressed in the report regarding certain subjects of the enquiry.

(1) *Ways in which Scarlet Fever is Spread.*—Personal contact is the method mentioned by the majority of those reporters who refer to actual methods of infection; such contact may be with frank cases, convalescents or carriers, especially when such infectors have unhealthy conditions of throat or nose. A large percentage of reporters consider that the spread of scarlet fever to-day is due to the fact that many infectors (in all three categories) go undetected, and therefore uncontrolled, because of the mild and typical forms in which the disease now manifests itself.

Fomites as agents in the spread of scarlet fever are mentioned comparatively seldom and there is very little conclusive evidence that scarlet fever is spread in this way. The possible rôle of fleas or other insects in this connection received still less serious attention.

The infrequency with which milk and dairies are referred to in connection with the dissemination of scarlet fever at the present time is noteworthy.

Among social factors in the spread of scarlet fever none is so frequently mentioned as the primary school.

(2) *The present type of Scarlet Fever.*—In the general opinion of the reporters the disease at present is remarkably mild and shows no tendency to any increased severity.

(3) *The effect of hospital isolation and treatment upon* (a) *the prevalence*, (b) *mortality*, (c) *fatality*, (d) *complications of Scarlet Fever.*—A considerable number of reporters state that they have no opinion to offer on this question: the percentage of reports in which some such answer is made (excluding those reports in which a blank space is left) is for (*a*) 20, (*b*) 35, (*c*) 40 and (*d*) 42.

Of those who express an opinion regarding the effect of hospital isolation and treatment on the incidence of scarlet fever, 51 per cent. think that this effect has been beneficial, while 29 per cent.

think that there has been little or no effect. Concerning the influence of hospitals on the mortality, fatality and complications of the disease the expressed opinions are nearly equally divided, in each respect, between those who think the influence has been a beneficial one and those who think there has been little or no influence. In respect of complications alone is there any disposition to think that hospital isolation and treatment have had a harmful influence.

The answers given by the medical officers of the twenty-five larger county boroughs produce a different summary: in this case the majority consider that the incidence of scarlet fever has not been influenced to any extent, or at all, by hospital isolation and treatment; and as regards mortality, fatality and complications opinion is not evenly divided but is definitely on the side of hospital treatment as a beneficial measure.

(4) *The possible connection between home overcrowding and the occurrence of return cases.*—Ninety per cent. of the reporters answered the question on this subject with a plain negative; very few give any data, but those who do, with one or two exceptions, provide evidence against the contingency.

B. Opinions expressed concerning the circumstances which should govern the question of removal of scarlet fever patients to hospital.

The great majority of replies show that the isolation and treatment in hospital of scarlet fever patients is considered *advisable* in most cases. The circumstances in which removal to hospital is most generally advised are:—inadequate facilities for nursing at home, overcrowding in the patient's home, the presence of other children in the infected house and the lack of suitable nursing services. Removal to hospital is considered *imperative* when these conditions are aggravated, when the case is a serious one, or when other members of the family are engaged at home or outside in such occupations as dairy work, shopkeeping, dressmaking and laundry work.

From many of the replies it would seem that, at present, the removal of a case of scarlet fever to hospital is advised and carried out as much in the interests of the parent as in those of the patient or the public.

C. Arrangements which are made for securing the admission of Scarlet Fever patients to hospital.

(1) In the Metropolitan Boroughs generally it is evident that hospital treatment for scarlet fever patients is encouraged, exceptional facilities exist for the prompt removal of patients and the family practitioner in most cases makes his own arrangements directly with the Authorities of the Metropolitan Asylums Board; at the same time, or afterwards, the Health Authority of the borough is notified of the case. In large Combined Districts and in some Rural Districts also, the family practitioner often makes his own arrangements. Admission of scarlet

fever patients to provincial hospitals both in urban and rural districts, is generally arranged, however, through the health department of the district concerned. It is not a general practice for the patient to be visited in his home by the medical officer or sanitary inspector before a decision is reached. Usually a health department on being notified of a case communicates at once with the hospital authorities and so arranges for removal—in most cases by a motor ambulance kept at the hospital.

In a certain number of districts (both large towns with well-organised health services and country areas) the sanitary inspector, acting for the medical officer of health, carries through all arrangements for removal and admission to hospital. In 112 districts the notifying practitioner deals directly with the hospital authorities while notifying the medical officer of health at the same time.

(2) In most districts the medical officer of health is said to satisfy himself that isolation and treatment in hospital are essential in each case; this is usually done through the sanitary inspector. In those places, where the methods are mentioned, a minority of reporters state that they do not so satisfy themselves, and this minority includes some of those who consider that most cases of scarlet fever, in their particular district, should be removed to hospital as a matter of course.

(3) The majority of reporters state that, in exceptional circumstances, admission to hospital can be arranged by various methods which are not allowed normally; in most cases these methods mean action through the sanitary inspector, or an independent arrangement between the attendant practitioner and the hospital authorities. A not inconsiderable minority of medical officers, however, lay down the rule that admission to hospital in all circumstances should be arranged primarily through the health department concerned.

(4) With very few exceptions, the answers imply that there is no difference in the procedure for epidemic and for inter-epidemic times. But in a few places it is the custom, during epidemic times, to initiate—or tighten up, as the case may be, the practice of selecting patients for hospital treatment.

D. Hospital Administration.

(1) *Methods of conveying Scarlet Fever patients to hospital.*—The general rule, with very few exceptions, is that scarlet fever patients are brought to hospital in a nurse-attended motor ambulance.

(2) *Bacteriological tests for Scarlet Fever patients.*—The majority of reporters gave no information on this matter, and presumably no routine bacteriological examinations on newly admitted patients are carried out by them. Twenty reporters give some results of their bacteriological investigations; all except one have found that a certain percentage of scarlet fever

patients harbour diphtheria organisms at the time of their admission to hospital; this percentage varies considerably at different hospitals and ranges from 15 to 0·94 per cent. Virulence tests with the isolated organisms are seldom carried out.

As a general rule, routine examinations for diphtheria organisms in scarlet fever patients awaiting discharge are not carried out. Special examinations, however, are made in the majority of hospitals when there are clinical reasons for suspicion.

(3) *The methods adopted at various hospitals for the isolation and treatment of Scarlet Fever patients.*—Ordinary ward-isolation is the method adopted in the great majority of the fifty-nine hospitals under review. In 15 hospitals barrier-nursing is carried out in varying degrees and in 6 of these instances, bed-isolation is adopted; exposure to fresh air in one way or another is stated to be a prominent feature in the treatment carried out at 13 hospitals; in 9 hospitals the various types of scarlet fever cases are kept distinct in special wards, and in 7 hospitals it is mentioned that cubicle blocks form part of the isolation system.

(4) *Special forms of treatment in hospital.*—The majority of reporters state that they have no experience of any special treatment which helps to lessen either the length or the cost of a scarlet fever patient's detention in hospital. The experience of certain hospitals where an otologist has been successfully employed for the radical treatment of the various conditions which give rise to discharges from the nose and the ear is noteworthy.

(5) *Standards for bed space (Scarlet Fever patients) adopted in the various hospitals.*—It is reported of most hospitals that a cubic space of 1,500—2,000 cub. ft. and a floor space of 144 sq. ft. are the standards usually observed; the figures quoted for wall space varied from 4 to 12 linear feet, but it is probable that while some of these figures refer to the space between the opposite edges of two contiguous beds others refer to the amount of total wall space allotted to each bed.

It is admitted by several reporters that in epidemic times there is a temporary relaxation of their normal standards, and half the number of reporters state that when this happens there is an increase in the number of complicated cases and cross-infections.

(6) *Length of time Scarlet Fever patients are kept in hospital.*—The great majority of hospitals evidently adopt—if only as a rough working rule—a minimum period of detention for the average uncomplicated case of scarlet fever. The most usual minima, according to the 46 replies received, are 28 days (in 18 instances) and 42 days (in 15 instances). From the statistics furnished and from information gained by further enquiries it appears that in some hospitals the average period of hospital detention for scarlet fever patients is becoming reduced, and in six of these hospitals this reduction has been a deliberate goal. Nearly all the measures taken to reach this goal are concerned with preventing the occurrence or the spread of complications, especially discharges

from nose, ear and throat; among the successful methods barrier-nursing and the routine employment of otologists may be particularly mentioned.

(7) *References to return cases.*—About the circumstances of return cases there is a difference of opinion: the majority of those who refer to the subject have no evidence to show that overcrowding in hospital increases the incidence of return cases, but a minority of reporters see a close connection between the two sets of circumstances; two reporters consider that return cases are due to insufficient detention in hospital, but they are opposed by six others, two of whom state that the incidence of return cases is diminished by reducing the hospital detention of uncomplicated cases.

(8) *Employment of an otologist at isolation hospitals.*—The majority of hospitals under discussion do not constantly employ a specialist for the radical treatment of morbid conditions of the nose, throat and ear, but enlist the services of such specialists only when required for urgent cases.

A few medical superintendents consider that none but acute and urgent cases of ear disease should be radically treated until the patient has left the hospital and convalescence is established.

At the City Hospital for Infectious Diseases, Newcastle-on-Tyne, at Birmingham City Hospital, and at Willesden Municipal Hospital (also at the Edinburgh City Infectious Diseases Hospital) a specialist in diseases of the throat, ear and nose is, or has been (Willesden), employed as a member of the medical staff, and in each case the appointment is considered to have proved a success.

(9) *Conditions governing the discharge of Scarlet Fever patients from hospital.*—Freedom from any visible signs of rhinitis, pharyngitis or otitis is laid down as a condition of discharge at virtually every hospital.

The majority of reporters consider that patients in the late stage of desquamation are not thereby infectious, and most of the members of this majority act on this assumption.

Final transference to an out-bathing discharge-block, both from general and from convalescent wards, is the rule; usually the transference takes place within 24 hours of actual discharge.

A final bath is the rule, and with few exceptions it is given in the discharge block. In more than half the number of hospitals the bath is given on the day of discharge.

The most common practice as regards the patient's going-out clothes is to disinfect them by steam at the hospital; not uncommonly, however, the patient leaves the hospital in clothes brought by the parent on the day of discharge.

(10) *Convalescence of Scarlet Fever patients.*—With two or three exceptions the hospitals under review do not transfer their scarlet fever patients to convalescent homes.

(11) *Instructions given to parents or guardians on the discharge of a Scarlet Fever patient from hospital.*—Two-thirds of the total number of hospital superintendents who sent in reports state that printed instructions are issued to parents when scarlet fever patients are discharged from hospital; by the remainder oral instructions are given in the same circumstances. The matters to which attention is most frequently drawn are the necessity for convalescents abstaining from close social intercourse in the home and outside (including school) for 14 days; the significance of discharges from the throat, nose or ear and the steps to be taken where such appear; the need for warm clothing and the danger of catching cold; the need for separate use of food utensils and toilet articles.

E. Scarlet Fever Problems in the Home.

(1) *Routine methods of home-treatment and isolation.*—Emphasis is chiefly laid on (*a*) the need for a separate room for the patient, (*b*) the services, if possible, of a whole-time nursing attendant, (*c*) the use of disinfectant in the sick room and of the disinfectant sheet hung across the doorway outside the sick room. In many places, and more particularly in urban districts, reliance is mainly placed on periodical inspection by the sanitary inspector or some other member of the local health department. For the guidance of those carrying out such inspection as well as for that of the householder printed instructions for preventing the spread of infectious diseases are commonly drawn up by medical officers of health and sent to infected houses. Copies of such instructions were received from a representative number of districts and, while differing a good deal in their scope and form, these pamphlets generally comprise a considerable amount of information and instruction concerning the home treatment control of scarlet fever patients. They include, but with more detail, all the different points referred to in the questionnaire answers as well as others in connection with the convalescence, recovery or death of the patient.

(2) *Special forms of home-treatment.*—As shown elsewhere, the general practice is to send most cases of scarlet fever to hospital, so that in less than 10 per cent. of the questionnaire reports is there any information about special forms of home treatment. Moreover, in the great majority of answers the reference is to some method of inunction treatment; and in 80 per cent. of the districts where such methods have been tried the treatment follows, more or less, closely the principles and practice advocated by Milne. In the remaining districts the practice of skin inunction is only carried out, or recommended, as a final precaution for preventing the dissemination of scales.

It is chiefly in small urban and in rural districts, where fever hospital accommodation is inadequate or lacking, that Milne methods have been tried either as a settled policy or in special circumstances. The majority of reporters in these places state that

they have found the Milne method, or some modification of the method, satisfactory. Only in a very few instances, however, is there any mention of the number of cases so treated, but figures have been supplied from Tottenham and Wealdstone, and the number of cases treated by Milne methods in these two districts during the last three years probably exceeds the sum total of cases similarly treated in the other districts.

(3) *Home visiting of Scarlet Fever convalescents.*—The number of reporters who respectively state that they do, and do not, follow up scarlet fever convalescents is about equal. It is possible, however, that the question on this matter was not fully understood and that the following-up of all convalescents—apart from the general surveillance of home-treated patients during their illness—is not so common as the answers imply.

(4) *Disinfection.*—(*a*) Steam disinfection is the most common method used in the treatment of bedding, bedclothes and the patient's personal garments. In rural districts, however, fumigation is the more common method, while it ranks second in urban districts. Other methods less commonly used for the bedding are spraying, stoving, baking and destruction. For personal clothes boiling, washing and soaking in disinfectant fluids are frequently mentioned.

For the furniture, fumigation and spraying are chiefly used; washing with disinfectants is also frequently mentioned.

In a large proportion of districts the child's toys are destroyed, and rather less frequently the books are similarly treated. Frequently such articles are sent to the local fever hospital for disinfection and retention if desired. Short of destruction, the most common method of dealing with books and toys is that of fumigation.

Scalding or washing—with or without disinfectants—are the methods used in most districts for the disinfection of food utensils.

Many methods for disinfecting the sick room are mentioned, but in a very large percentage of districts fumigation—either alone or in conjunction with other devices, especially spraying—is the most usual method. In very many districts the fumigation of the room is evidently considered a satisfactory way of disinfecting exposed articles in the room. Spraying is frequently carried out and is considered by many to be a useful incentive to a general "spring-cleaning" of the room.

It is the exception to disinfect the hall, bathroom or W.C., but where this is done the methods employed are usually those carried out in the sick room.

(*b*) Formaldehyde vapour and sulphur dioxide gas are the only fumigants mentioned; the former substance is much more frequently used than the latter. Formalin is chiefly used in spraying. Carbolic acid, cresol, cyllin, izal and Jeyes fluid are among the disinfectants mentioned.

(*c*) In all except a negligible number of districts disinfection is carried out by some member of the sanitary staff.

(*d*) The cost of disinfection varies with the local circumstances, including the distribution of the population, the method of isolation adopted, and the measures used. Generally speaking the cost is greatest in country districts, in home-treated cases and where steam-disinfection is carried out. An analysis of the figures given regarding costs of disinfection—excluding wages of staff employed—shows that in over 50 per cent. of the urban districts the cost of disinfection is estimated at under five shillings per case and that it is comparatively rare for it to exceed ten shillings. A further enquiry into the total costs of steam disinfection in certain towns shows that these vary from 6s. 5d. to £1 13s. 4d., and that the heaviest charges are in respect of wages of staff and transport.

(*e*) Judging from the answers received, a small majority of reporters consider that their respective methods of terminal disinfection are efficacious. But it is also evident that a considerable number of reporters have little or no faith in the virtue of terminal disinfection, though only a very few of these have so far considered it expedient to leave off, or materially modify, their traditional practice.

From comparative studies of results (as measured by the occurrence of subsequent cases) it does not appear generally that the suspension or partial suspension of traditional measures of terminal disinfection has been followed by any unusual number of subsequent cases nor by any other drawbacks.

F. Practice Concerning the Continuance at, or Return to, School, Business, etc., of Contacts and Convalescents Respectively.

In considerably more than half the total number of answers it is stated that convalescent children are not sent back to school until a certain period has elapsed after their discharge from hospital or release from home isolation; this period in the great majority of districts concerned is 14 days.

Similarly, in all but a few districts, children who have been in contact with patients afterwards removed to hospital are kept from school for periods varying from 7 to 28 days; the most usual period is, again, 14 days, but in 100 districts the period is 10 days and in 74 it is 7 days.

The period of enforced absence from school is much greater in the case of children living in houses where patients are being home-nursed; in some districts this period of absence synchronises with the duration of the patient's illness; in a larger number of districts the quarantine of the contact is extended to so many days after the patient's release from isolation and the most usual period is 14 days.

From both positive and negative evidence it appears that no control is generally exercised over adult contacts unless such individuals are occupied in certain trades or duties where they are liable to carry infection; milk dealers, workers in clothing trades

and public servants are chiefly mentioned in this connection. The arrangements advised for such adult contacts include a period of quarantine (usually seven days), boarding-out, daily inspection and personal disinfection.

B—Further Consideration of the Data provided by the Questionnaires and Other Information

Opinions Expressed Regarding:

(1) *Methods of Spread of Scarlet Fever.*—In our opinion it is a difficult, perhaps an impossible, task to assess the relative importance of the different ways in which scarlet fever may be spread. A little reflection shows that we are at present unable to measure in any unambiguous way the relative infectiousness of different diseases. Perhaps the scale of relation that most medical men consciously or unconsciously adopt is to assess the infectiousness of a disease by the ratio of susceptibles attacked to total susceptibles in a unit of observation (household, family, school) within which a case of the disease has occurred. For this purpose a susceptible is taken to be a person below a certain age who has not previously been attacked by the disease. Measured in this way the infectiousness of measles—which one may take as a standard instance of a highly infectious disease—is far greater than that of scarlet fever. One of the longest series of observations upon scarlet fever from this point of view is that of Dr. W. St. C. McClure (80*b*), of Manchester. Dr. McClure analysed some 15,000 cases occurring during 1909–13, where the primary case was in a patient removed to hospital, the attack rate upon susceptibles in the houses giving rise to primary cases was 9·6 per cent. When the first occurring case was treated at home, the attack rate on susceptibles was 14·0 per cent. These figures, which are consistent with those of a somewhat earlier period (1907–8), analysed by Dr. Arnold (1*b*), may be contrasted with the sufficiently accordant results of various observers of measles. Dr. William Butler (20*b*) obtained a mean attack rate on exposed susceptibles of 66·1 per cent., and in the age group 0–4 years, 77·6 per cent. Of 217 boys in Marlborough College who had not previously had measles the percentage attacked was 83·4 per cent. We have found on analysing some of the admirable manuscript records of the late Dr. Reginald Dudfield, Medical Officer of Health, Paddington, that 53 per cent. of the susceptible population of infected houses (778 susceptible persons) were attacked, and of 425 members of 312 families 72 per cent were attacked. Judged by this rough test, measles is some seven times as infectious as scarlet fever. This criterion leaves, however, a good deal to be desired. An interesting feature of Dr. McClure's analysis is that the attack rate is independent of the size of the unit of grouping. One might, perhaps, have expected that the dilution of infective persons would be of some importance, that the attack rates on houses containing 1, 2, 3, etc., susceptibles would not be sensibly equal. Actually,

in Dr. McClure's series, they are sensibly equal. Thus, in the hospital cases, the attack rates were 9·4 per cent. on houses with 1 susceptible each (*i.e.* 9·4 per cent. of the total susceptible population so housed), 9.4 per cent. on groups of 2, 9·2 per cent. on groups of 3 and 9·8 per cent. on groups of more than 3. Similarly for the home series, the percentages were 12·8, 14·8, 14·0, 14·2. Dr. Dudfield's data for measles suggest (the figures are based upon small absolute numbers) that the proportion of susceptibles attacked decreases with the size of the unit. In houses with 1, 2, 3 and 4 susceptibles, the percentages attacked were 67·0, 61·8, 53·8 and 36·2.

The same difference is brought out in another way if one considers the proportions of houses containing susceptibles which return no cases. Were the distribution to be purely fortuitous, if the disease were not infectious at all, with increasing numbers of susceptibles the proportion of houses with no cases should decline in a regular fashion. Thus for Dr. McClure's "Home" series, the "expected" proportions of houses containing 1, 2 and 3 susceptibles which had no secondary cases would be $86{\cdot}0 \pm 1{\cdot}10$, $74{\cdot}0 \pm 1{\cdot}95$ and $63{\cdot}7 \pm 3{\cdot}33$. The actual percentages were 87·1, 75·8 and 73·3. The uninfected houses with 3 susceptibles are somewhat in excess, but the discrepancy between calculation and observation is far greater in the measles data, where against "expected" percentages of $46{\cdot}5 \pm 3{\cdot}45$, $21{\cdot}65 \pm 3{\cdot}93$, $10{\cdot}07 \pm 3{\cdot}99$, we have observed values of 33·00, 16·36 and 24·56.

The *prima facie* inference is that, in measles, dilution of infective cases even with susceptible material diminishes the relative risk of infection more than in scarlet fever. The experimental work of Dr. Greenwood and Professor Topley* has demonstrated that the regular addition of susceptibles to a population containing a proportion of mice infected with a pasteurellosis is more effective in increasing the death rate than much larger additions at irregular intervals.

The practical conclusion is that the conditions which determine the spread of scarlet fever within the family, household or school, are extremely complex and that we are not at present in a position to adjudicate upon the claims of various factors to be assigned a principal share. It is not going too far to assert that both in our own enquiry and in the literature, those observers with the widest experience have been most cautious in expressing opinions.

A point which it is necessary to make here is that evidence, even amounting to demonstration, that the hospital isolation of primary cases of scarlet fever diminishes the attack rate on susceptibles is not necessarily inconsistent with the contention that isolation does not diminish the total volume of scarlet fever. The analyses of Dr. Arnold and Dr. McClure to which we have referred create an extremely strong presumption that the immediate attack rate upon susceptibles in houses from which the primary cases have been removed is significantly lower than upon houses

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* J. Hygiene, 1925, XXIV, 45–110.

where the primary case has been treated at home. It does not, however, follow that if the susceptibles of the two classes were followed until they passed beyond the age when scarlet fever of the present type is seriously infective, the complete attack rates upon the two classes would be different. No such "following-up" on a statistically adequate scale can be carried out, so that one is forced to rely upon the intrinsically less satisfactory evidence of general morbidity and isolation statistics. As will presently appear, an analysis of such data leads to purely negative results, it is not possible to demonstrate that isolation rates and attack rates are associated in any significant way.

The reason of our ignorance of the relative importance of the various aetiological factors of scarlet fever is, of course, the impossibility of studying each in isolation by the experimental method. We have not even sufficiently detailed information to enable us to utilise the very imperfect substitute for the experimental method which modern statistical science has placed in our hands. It is much to be desired that even more detailed analyses than those of Dr. Arnold and Dr. McClure should be undertaken in other great cities.

(2) *The Present Type of the Disease.*—There is a suggestion here and there that scarlet fever is re-appearing in its old dreaded form, and among the experiences related by reporters which give some support to these suggestions may be mentioned that of Dr. Howard (Portland U.D.). A domestic outbreak in which some of the patients were attacked and killed by a very malignant form of scarlet fever occurred in Lanarkshire during 1922, and the "Medical Officer," which contains a reference to this event, has remarked in its issue of August 1st, 1925, that "there are indications that scarlet fever is increasing in severity." Many of the isolated instances in which the clinical characters of the disease have been unusually severe have been among families or in single households, and should possibly be attributed to a peculiar family susceptibility rather than to any general or even local increase in the virulence of the disease. In recent years, however, the Registrar General has commented on the greater mortality and fatality of scarlet fever (and diphtheria) in the North than in the Midlands and South of England;* he also alludes particularly to the high mortality in Bootle, Liverpool, Birkenhead and St. Helens. Dr. Stallybrass, in a paper on the "Variations in incidence and fatality of Scarlet Fever and Diphtheria" (116*b*) refers to these remarks of the Registrar-General and states that both prevalence and fatality of scarlet fever have increased simultaneously in St. Helens and the Merseyside Boroughs and that in Liverpool during the last 20 years the prevalence and fatality have varied together. The death-rate per 100,000 inhabitants in the City of Liverpool.

* But in 1923 "the (mortality) rate was highest in the county boroughs, not of the North, but of the Midlands, and lowest in the county boroughs not rural districts, of the South." (Registrar-General's Stat. Rev. of England and Wales 1923 (Text), p. 50).

after dropping steadily from 16·0 in 1918 to 4·7 in 1922, rose to 5·2 in 1923 and to 7·5 in 1924.*

The Registrar-General also brings out the interesting fact that in 1922 and 1923 fatality decreased with urbanisation in the South (apart from London) and increased with similar events in the Midlands and North.

Among factors which it has been suggested may possibly account for local differences in the severity of scarlet fever is the introduction of an alien and more virulent strain of the disease or, on the other hand, a comparatively high racial susceptibility to the local strain in the case of immigrants. This question was followed up to some extent in the case of the London Boroughs ; but, on the whole, it does not appear that the fatality in those boroughs subject to immigration is any higher than in the west-end boroughs. During 1923, it is true that the case mortality of 2·83 in Poplar was higher than that in other boroughs, but this may have been due to other local factors besides that of immigration. It would be interesting to know, however, whether any local variations in scarlet fever fatality occur in such places as Liverpool and Glasgow, and if so, whether the higher fatality rates were incident on the " foreign " quarters of these cities.

Apart from the severity of the disease as measured in terms of case-mortality there are also a few indications that in certain years recently the complications of scarlet fever have become more prevalent, and especially those classed as " septic complications."

It is difficult to assess accurately the significance of these small scattered clouds on an horizon generally pronounced clear. There is, perhaps, no prevalent specific infectious disease which has shown such a transformation in its clinical character as scarlet fever ; this disease, with its 888 deaths during 1924, is not even mentioned by name in a table of " Deaths from Principal Causes, 1924,"† where influenza is shown to have killed 18,986 people, measles 4,834, whooping cough 3,983, and where diphtheria even (with its elaborate machinery for prophylactic and clinical control) is seen to have caused 2,501 deaths. Judged by the present, then, the outlook would appear to be satisfactory ; but a reference to the records of the past should temper, we think, any hasty conclusion that the present mildness of scarlet fever is a permanent phenomenon. The lull that followed the raging manifestations of scarlet fever during the last part of the eighteenth century was rudely broken by the malignant epidemic that broke over Dublin in 1834 and provides an historical warrant for caution against any undue complacency at the present time. Fortunately, the machinery for registering the indications of any impending changes is now more delicate than it was and should prevent us from being taken unawares.

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* These figures are taken from Dr. Hope's Annual Report for 1923, p. 25, where it is stated that the figures for 1924 are subject to correction.

† Ministry of Health, Chief Medical Officer's Annual Report " On the State of the Public Health, 1925," p. 8.

(3) *The Effect of Hospital Isolation and Treatment upon the Prevalence and Mortality of Scarlet Fever.*—Disappointment with the part played by isolation hospitals in the control of scarlet fever has been expressed from time to time during the past 30 years and by those concerned with the care of hospital patients as well as by onlookers. Thus J. T. Wilson in 1897 (138) and from the records of death statistics came to the conclusion that mortality has not diminished on account of isolation; Seaton (111), from statistics in Surrey, and Millard (89*c*), on evidence collected from wider sources, came to similar conclusions; Franklin Parsons, in his Report on Isolation Hospitals 1910 (98), states that isolation of scarlet fever in London has not produced a greater diminution of cases; and A. K. Chalmers, in his Presidential Address to the Royal Society of Medicine, 1920, alludes to the abrupt rise in incidence during 1909–1917, which "taught us there were features in the natural history of scarlet fever which isolation did not cope with." More recently there is the candid confession of the late W. J. J. Stewart (118), himself a hospital superintendent, who in 1922 read a paper on "The failure of the isolation hospital to diminish the incidence of scarlet fever."

(4) *The Possible Connection between Domestic Overcrowding and the Occurrence of Return Cases.*—In the past, as in the present, there has been a difference of opinion concerning the possible relationship between home conditions and the incidence of return cases. In 1894 Theodore Thompson (122*a*) investigated a series of return cases in connection with discharges from the Bromley and Beckenham Joint Hospital and concluded that the social conditions of the homes in which the return cases occurred were partly responsible. Then F. M. Turner, in 1906 (127*a*) showed that whilst no relationship could be found between the occurrence of return cases and particular hospitals of the Metropolitan Asylums Board, a definite correlation existed between the incidence of return cases and certain of the Metropolitan Boroughs. Following up this line of enquiry Arnold (1*b*), in 1907–8, made a very careful study of the relation between housing and the return case-rate in Manchester. He showed that, while there were numerically more return cases in the overcrowded homes, the percentage of susceptibles infected in the comparatively overcrowded houses of patients removed to hospital was lower than that in the less crowded houses of those treated at home.

Harold Kerr, however, as a result of "A Study of Return Cases" (70*a*) made during 1913–14–15, found that the percentage of return cases varied inversely with the degree of overcrowding.

It is unfortunate, perhaps, in the interests of useful enquiry, that "return cases" have become regarded as of disreputable origin, and a high return case-rate as a bar sinister in the statistical records of fever hospitals; a certain proportion of return cases seem to be inevitable in the best managed institutions.

Circumstances which Govern the Question of Removal of Patients to Hospital.

For conclusions under this heading see Part IV.

Arrangements for Securing Admission to Fever Hospitals.

In the interests of local public health administration it is desirable as a general rule that hospital treatment for scarlet fever patients should be secured through the medium of the local health authorities, provided that no unnecessary delay is entailed in its procedure. Where this is not the rule, and the general practitioner arranges directly with the hospital authorities, notification of the case may be delayed and the medical officer of health is further deprived of the opportunity of exercising any selection in the cases recommended for hospital treatment. In many districts where the medical officer of health is also medical superintendent he has, naturally, no difficulty in keeping touch with cases as they become known, and in exercising his judgment concerning the advisability of admissions. There are special circumstances, of course, where formal methods may seem unnecessary or may involve undesirable delay, but, as the reports show, each district has devised special arrangements to suit local conditions.

The case of London is rather different from that of cities and districts in the provinces. The group of fever hospitals belonging to the Metropolitan Asylums Board form an independent organisation, with which the Metropolitan health officers have no direct or indirect official connection, as obtains so often in the provinces. And in normal times there is sufficient accommodation in these hospitals to meet all the needs of the London area. Direct dealings between the medical attendant and the M.A.B. hospital authorities have become, therefore, a recognised practice, and the admission of every notified case of scarlet fever—a bed being available—has become an accepted tradition. In times of emergency, however, as the epidemic of 1921 proved, the resources of even the M.A.B. hospitals may become inadequate, and it then becomes necessary for the Medical Officers of Health to select the cases for which they consider hospital isolation and treatment is most urgent. But it is at least questionable whether, with scarlet fever in its present mild form, selection should not be exercised in inter-epidemic times in order to set free beds for more urgent cases of other infectious diseases, and there are not wanting medical officers of health in London who consider that the present system of routine removal to hospital has definite administrative drawbacks, and is not consonant with the present-day circumstances of scarlet fever.

Hospital Administration.

(1) *Methods of Conveying Scarlet Fever Patients to Hospital.*—The substitution of motor transport for horse-drawn ambulances, together with the increasing use of telephones, has certainly proved of great value in the control of infectious disease and prompt removal to hospital has now become possible for the most

isolated country patient, provided that his home is accessible by road. And there is much to be said for making the isolation hospital the headquarters of the ambulance service in small urban and country districts combined for hospital purposes, for in this way such districts are spared the greater expense of maintaining their own ambulances ; moreover, there is the additional advantage that the hospital ambulance (despatched as soon as the request for a bed has been granted) in most cases will carry with it a nurse for the care of patients during transit.* The reports show that, at the present time, the number of districts where no regular ambulance is available, either in the particular district or from the nearest isolation hospital, is very small. In such districts the arrangements made for the occasional removal of an infectious case must necessarily be of a make-shift kind. There is no evidence in the reports that infection has been distributed during the transit of scarlet fever patients, either in the unusual vehicles occasionally used for the purpose in country districts or in the regular ambulances which are in constant requisition in populous districts.

(2) *Bacteriological Tests.—Prima facie* the advantage of these examinations is not obvious. Experiences like those of Dr. Snell at Coventry would seem to shake belief in the tradition that scarlet fever patients are peculiarly susceptible to diphtheritic infection ; they might possibly be explained by the assumption that some individuals have a specific susceptibility to scarlet fever and others to diphtheria, so that those individuals who had succumbed to scarlet fever would thereby be less likely to become ill with diphtheria. From the point of view of hospital administration it would seem more important to know the percentage of patients possessing virulent diphtheria bacilli for even a small number of such individuals, if unexamined, might give rise to several cross-infections before being detected. R. T. Grant, in a paper on "The Diphtherial Infection in Scarlet Fever" (48), concludes that routine bacteriological examination and subsequent isolation where necessary reduces materially the incidence of post-scarlatinal diphtheria.

(3) *The Various Methods of Isolation.*—The particular method of isolation adopted in any hospital evidently depends upon the construction and circumstances of the hospital and to some extent also on the personal views of the medical superintendent in

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* Attention may be drawn here to Section 63 of the new Public Health Act, 1925, which allows any carriage or ambulance—provided either under Section 123 of the 1875 Public Health Act or under Section 13 of the Isolation Hospitals Act—to be used for the conveyance of persons upon their discharge from a hospital, or of persons not suffering from an infectious disease, provided that suitable precautions are taken to prevent the communication of disease. The 1925 Act allows a reasonable charge to be made by a local authority or isolation hospital committee for the use of a carriage in conveying patients on their discharge from a hospital or on the removal of cases of non-infectious disease, but not for the use of an ambulance provided under the Public Health Act, 1875, in the removal of a case of infectious disorder.

charge. Generally speaking it appears that there is, in the larger hospitals at any rate, a tendency towards a more intensive isolation of certain individual patients rather than the mass isolation of cases according to the labels of their particular diseases. And the practical application of this tendency is seen in the attempts to nurse certain cases on surgical lines, or in the provision of smaller compartments where single cases or small groups of similar cases can be excluded from the common run and receive special nursing and treatment. Treatment on surgical lines or aseptic nursing embraces both bed-isolation and barrier-nursing. These terms are sometimes used loosely, and the two methods, while based on the same principle, differ only in the degree to which that principle is applied; both methods are inapplicable to diseases which are spread by aerial convection.

The merits of bed-isolation are open to question, and it does not appear either from the questionnaire reports or from other sources that this comprehensive form of aseptic nursing as originally carried out at the Fazakerley Hospital has many enthusiastic advocates.

The barrier method is evidently the more popular, either as an auxiliary method for use under special circumstances, or more rarely as a routine measure. There is a flexibility about aseptic nursing which makes a trial of this method seem possible without any structural alterations in the hospital and without the differentiation of nurses. Incidentally, also, it raises the general standard of nursing in a hospital and makes the care of fever cases a more interesting matter to the staff. But, at the same time, the success of any form of aseptic nursing implies, by general consent, the possession of a highly trained, interested, and trustworthy nursing staff which must also be large enough to cope with the individual strain which this form of fever nursing entails.

Unfortunately, small hospitals, where barrier-nursing would most usefully compensate for the usual lack of small ward and cubicle accommodation, are just the places where it is generally impossible either to obtain or retain a staff of this kind. It is all too common to find at present that these small hospitals have great difficulty in adjusting their nursing staff to the varying needs of their district; in quiet times the nurses are greatly reduced in number, while in epidemics they have to be rapidly recruited. Under such circumstances the training or retention of a special staff would be out of the question.

The success of bed-isolation or barrier schemes also depends in part upon the patients, and these, like their nurses, must come under a rigid discipline which is often not tolerated by adults and which in the case of children can only be maintained by constant care and supervision. At the same time, it is evident that in some hospitals, where a good staff is available and a good tradition exists, barrier-nursing is a very efficacious method of dealing with scarlet fever patients. It seems especially successful where all newly-admitted scarlet fever cases are barrier-

nursed for the first 10 or 14 days and where, at the end of that time all complicated cases are removed to other wards for ordinary nursing; or where cases developing complications are removed, as these complications occur, to smaller wards, where they continue to be barrier-nursed. In these circumstances the spread of septic complications is checked and the risk of cross-infection from patients admitted with a wrong diagnosis or whilst incubating a second infection is reduced.

The use of small wards, side wards, cubicles, etc., for the closer segregation of special cases, often implies more outlay on the original construction, or in the subsequent structural alterations, of a hospital. But the provision of such conveniences, especially in small hospitals, is followed eventually by a reduction in the running costs of a hospital both as regards upkeep and nursing staff. Cubicles (containing one bed) also provide additional safeguards against the spread of infection; no ward discipline is required of the patient and the interchange of personal articles can only occur through very gross carelessness; it is easier, also, for a nurse to carry out aseptic principles where she must pass through the open air in order to reach one cubicle from another. The risk of cross-infection with air-borne diseases is practically eliminated by cubicles. The obvious barriers that surround each patient also have a psychological effect upon those in his attendance, for they constantly proclaim the possibility of danger and the need for keeping up a precautionary routine.

From the evidence supplied by the questionnaire reports and from subsequent special enquiries it does not seem that open-air wards or verandahs can, in this country, be counted as permanent additions to the usual ward accommodation of fever hospitals. Open-air treatment, indeed, is often considered inadvisable at just those seasons when scarlet fever is most prevalent and beds most needed; and even at Nottingham verandah treatment is not enforced during very cold, damp weather. Concerning the value of fresh air treatment, whenever and howsoever it can be adopted, there is general agreement; for septic cases and for the prevention of cross-infection it is probably the most important consideration of all. Opinions are divided concerning the propriety of open-air methods for cases of nephritis but most observers would probably agree that patients with nephritis and infants are peculiarly susceptible to changes of temperature and should not pass the night on open verandahs.

But in view of the fact that, generally speaking, it is the minority of serious, and particularly septic, cases which profit most from open-air treatment, it seems worth considering whether the arrangements commonly made at present for securing such treatment cannot be improved so as to make the treatment available at all seasons. The aspect of the verandahs east or west, for example, has been determined at most hospitals by the fact that the pavilions have an orientation north and south and the erection of verandahs has only been possible along the sides of the pavilions. A southern aspect for open-air treatment is

obviously the most desirable, and where such treatment is reserved for the exceptional minority, rather than for the ordinary majority, of scarlet fever patients it might, in the case of existing buildings, be possible to annex verandahs at the southern end of pavilions. The depth of open-air verandahs is also a matter of some importance, and nothing under 12 feet, according to general opinion, suffices to protect against driving rain. Heating of verandahs is not apparently considered an advantage by those superintendents who were specially consulted on the subject. A smaller matter is the use of wheel castors on the beds of patients undergoing verandah treatment to facilitate movement of the beds.

For the majority of patients who are retained in the general wards a considerable amount of fresh-air-treatment is possible by means of window ventilation; as demonstrated in the wards of Ham Green Hospital, the thorough application of this method throughout the year has proved quite feasible, and in conjunction with barrier-nursing has been followed by excellent results.

(4) *Special Forms of Treatment Practised and* (8) *Appointment of Otologists.*—It is frequently mentioned in the reports that a high average length-of-stay-rate is generally due to cases with complications so that any policy designed to reduce or prevent the occurrence of such cases will, at the same time, help to keep the average rate down. The most important administrative measure for this purpose is probably the careful grading of newly admitted patients and the prompt and special isolation (in small wards, cubicles, etc.) of cases showing any signs of septic complications. There is much to be said, also, in favour of such a plan as that adopted by Dr. Peters, of the Ham Green Hospital, where all new cases are treated on the bed isolation system and where the septic cases are combed out as they occur and treated in separate wards, still on aseptic lines. In these ways, not only are the patients with complications brought quickly under special observation and treatment, but the uncomplicated cases are prevented from contamination and the average length of stay for all patients is thereby reduced.

While there seems some reason to doubt whether patients with discharging ears are, on that account, a source of scarlet fever infection, there is no question but that ear complications generally account largely for the instances of prolonged stay in hospital and often inflate the average period of detention figures in the case of scarlet fever patients. In the majority of hospitals under review surgical measures for the cure of morbid conditions of the throat, nose and ear are not usually carried out during the patient's stay in hospital except where an operation is urgently necessary. The enquiry has disclosed the fact, however, that in certain hospitals a specialist is appointed for the purpose of dealing rapidly with morbid conditions of the ear, throat and nose while the patients are still in hospital. It appears that, in most of the hospitals where this policy is adopted, the hospital detention of patients suffering from these complications is materially reduced and this

reduction is reflected also in the lowering of the average length of stay for all cases. The experiment is being tried at certain hospitals of the Metropolitan Asylums Board and is the subject of two reports by Mr. T. B. Layton (77). A report by Mr. Neil Maclay concerning the treatment of aural suppuration in scarlet fever patients at Newcastle will be found in Appendix D. The results obtained in London and Newcastle and at other hospitals mentioned in the text should, we think, help to allay the misgivings of those who consider it inadvisable to attempt surgical treatment for chronic otorrhoea and allied conditions while the patient is still an in-patient of a fever hospital. Moreover, if the results continue to be satisfactory, something will have been done to check the amount of chronic ear disease and of unhealthy throat conditions which so commonly follow an attack of scarlet fever in children. Of equal interest and practical importance is the contention in some quarters that the appointment of an otologist to the staff of a large fever hospital means a quicker turnover in the matter of beds and an actual saving of hospital costs. Such appointments are obviously not practicable, or even desirable, in the case of every hospital, but as far as the larger fever institutions are concerned, the examples set in London, Newcastle, Edinburgh and Birmingham seem worthy of close attention.

In discussing the results obtained by treating septic cases in specially isolated wards or by aseptic methods some superintendents lay stress on the importance of fresh air as an auxiliary, and it seems certain that septic conditions do react most favourably to the influence of fresh air, light and sunshine where the help of these agencies can be enlisted.

As regards special treatment of bacteriological origin, there are only a few isolated references in the questionnaires concerning the use of anti-streptococcic serum and the opinions of the reporters concerning the usefulness of this serum are conflicting. Fuller information about the use of autogenous vaccines at the Hospital for Infectious Diseases, Newcastle-on-Tyne, has been reported to us. In this report Dr. T. N. V. Potts concludes that stock or autogenous vaccines proved of great value from a prophylactic standpoint, but as a means of curing scarlatinal otorrhoea and rhinorrhoea after the acute inflammatory process had subsided, they were only of benefit in certain selected cases.

At the present time trial is being made of a curative serum (from horses) prepared in the Wellcome Research laboratories. The experience of those who have tried this antitoxin serum is that the initial symptoms, malaise, rash, etc., are definitely and quickly improved. The serum has little effect on mild cases; but, if given early and in large doses, patients with acute toxaemia show a striking improvement in their symptoms. If administered late in the disease serum is quite ineffective and in this respect, among others, the resemblance of its conduct to that of diphtheria antitoxin will be noted. In this country no direct effect on complications has been observed, but some American workers have

found that both the number and the severity of complications are reduced. Up to the present a large percentage of patients treated have, unfortunately, suffered from serum sickness; but the history of diphtheria antitoxin warrants the hope that by reducing the bulk of the dose and by eliminating the protein constituents of the serum this drawback will be overcome.

The following notes concerning the prospects offered by recent research in the diagnosis, prophylaxis and treatment of scarlet fever have been supplied by Dr. E. H. R. Harries and may usefully find a place here :—

(*a*) The Dick test is a reliable index of susceptibility or otherwise of the toxin of the streptococcus scarlatinae.

(*b*) Active immunisation of susceptibles is obtainable by means of multiple skin test doses of Dick toxin. I am not yet satisfied as to the best range of doses, and I cannot so far say anything very helpful as to the duration of the active immunity produced. We have actively immunised in residential institutions and elsewhere a fairly large number of children. I hope to be able to express a more definite opinion about this phase of the work later on.

(*c*) The Schultz-Charlton reaction carried out with 0·2 c.c. of high dilutions of sera of high blanching titre is, when positive, pathognomonic of scarlet fever. The Dick test and the Schultz-Charlton test combined are of very great diagnostic assistance in a doubtful case of scarlet fever.

(*d*) Doses of 2·5 to 5 c.c. of a concentrated scarlet fever antitoxin of high blanching titre will protect a Dick-positive child exposed to scarlet fever certainly for ten, frequently for fourteen, and occasionally for as long as twenty-eight days. These figures are based upon the return of the Dick test to positive.

Serum disturbances from such small doses of concentrated serum are usually absent. If they occur, they are trifling only.

(*e*) Scarlet fever antitoxin I believe to possess value of the same order as diphtheria antitoxin. Concentrated sera are now being produced in this country which will give a definite Schultz-Charlton reaction with 0·2 c.c.. of *1* in *16000* dilution. The curative value of such sera is very great. The objection to the earlier unconcentrated sera was the frequent production of severe serum sickness. Serum sickness when concentrated sera are employed is no more frequent or severe than that which occurs with the corresponding concentrated diphtheria antitoxin; hence the main objection to the use of scarlet fever antitoxin in the milder type of case has disappeared.

In my experience scarlet fever antitoxin only directly influences the toxaemia. The immediate effects are rapid fall of the temperature, and reduction in the pulse-rate; fading of the rash, and marked general improvement in patient's feeling of well-being. The appearance of desquamation is accelerated, and is usually limited in amount. Non-septic cases treated early with a sufficient dose of scarlet antitoxin show a notable absence of complications. Scarlet fever antitoxin has no direct influence upon the septic type of case, except as the Dicks have stated, that by relieving the patient of toxaemia, it enables the tissues the better to deal with the septic manifestations. A combined antitoxic and anti-bacterial serum of American origin, although of undoubted high antitoxic value, has not, in our hands at any rate, proved its antibacterial claims.

Scarlet fever antitoxic serum will, I believe, play an important part in the scarlet fever problem in the future. Its early use by the general practitioner would enable many more cases to be treated with safety

at home, and would in prophylactic doses give immediate protection to the "contacts" in the house in the same measure, but on the average for a shorter period, than a prophylactic dose of diphtheria antitoxin. Its routine use in fever hospitals will undoubtedly diminish the average length of stay considerably."

Dr. Kirkhope, working with Dochez serum at Tottenham, writes hopefully of the treatment in his 1924 report (72). He notes that quite a large area of skin around the site of the inoculation remains normal, while other parts are suffused with the rash. He also remarks that the disturbance due to serum sickness is just as marked with small doses (2 c.c.) as with larger ones (10 c.c.).

(5) *Standards for Bed Space.*—In some reports it is stated that the standards are in conformity with those set by the Central Health Authority, and it may be well to state here what dimensions are prescribed at present by the Ministry for the construction of wards. It is usual, when sanctions for a loan are required, for the Ministry to prescribe, as minima for multiple-bed wards, 1,872 cub. ft., 144 sq. ft., and 12 linear ft. (of wall space) per bed. These dimensions are most economically obtained in wards 24 ft. wide. In the case of cubicles and single-bed side-wards the permissible dimensions are 12 ft. by 10 ft. by 10 ft. high.

There is considerable evidence to show that any serious diminution of these standards is unsatisfactory and that the overcrowding of wards—in times of epidemics or in undersized hospitals—is followed by an increase in the number of complications, cross-infections and return cases. Franklin Parsons (98), for instance, in 1910 drew attention to this effect of overcrowding, and as recently as 1923 J. R. Hutchinson (63) reported on the continued prevalence of scarlet fever and diphtheria, in a country district, which was caused mainly by serious overcrowding in the local fever hospital.

Of the three factors concerned in the provision for each patient of a safe proportion of the total cubic space of a ward, height is probably the least important; it is lack of sufficient floor space, and, in particular, the undue proximity of beds—floor overcrowding, in fact—which is generally responsible for an unusual number of cross-infections, complications and return cases. This fact was well illustrated by the military experiences of cerebro-spinal fever. The prime importance of floor space in the proper management of scarlet fever provides a strong argument for the careful selection of scarlet fever cases for admission to hospital in epidemic times, if not for some measure of selection in normal times, in the case of those hospitals where accommodation is always limited.

(6) *Length of Stay in Hospital.* (7) *Return Cases.*

For conclusions on these subjects see Part IV.

(9) *Conditions Governing the Discharge of Patients from Hospital.*—The unanimity among reporters regarding the special necessity of withholding patients from discharge who are visibly suffering from any morbid conditions of throat, nose or ears is in accord with the convictions that have become established as the

result of many previous enquiries. But there still remain also the special administrative difficulties in the case of those patients with chronic discharges whose departure from hospital is delayed for several weeks or even months. It would certainly seem probable that these difficulties would be removed to an appreciable extent if the practice of radically treating the underlying causes of these conditions during hospital detention were more widely adopted. Moreover, the surgical treatment of such patients during their stay in hospital would probably diminish the number of those patients who leave hospital apparently quite healthy and then, after a few days at home, begin to suffer again from aural or nasal discharges, which may prove infective to others. Whether discharges from the ears, unallied with any nasal discharge, are in practice a source of infection, is a question that does not seem to have been satisfactorily settled, but there are among the reporters experienced observers who consider that patients with otorrhoea do not infect others unless at the same time they are also suffering from some unhealthy condition of the pharynx or nares.

As long ago as 1902, and as the result of an inquiry by Killick Millard (89*e*), it was noted that opinion had changed regarding the influence of late desquamation in the spread of scarlet fever. The majority of hospital superintendents circularised by Millard on that occasion were agreed that late peeling was of little consequence; C. E. Matthews, also, reporting to the Metropolitan Asylums Board in 1905 (84), found that there was little difference in the infecting-case rate of peeling and non-peeling patients respectively. The present enquiry strengthens the growing conviction that the period of late desquamation is not an infectious phase of the patient's illness. *Prima facie* there seems no reason why the skin should not retain infection like the mucous membrane. And there are a few who consider that the skin flakes, while not inherently infectious, may act as vehicles of infection derived from the nose or throat, just as a soiled handkerchief or portions of food might do. On this supposition may be explained the different practice observed by some authorities as regards the peeling of hands and feet respectively: peeling hands are considered to be potentially more dangerous than peeling feet because contamination with infective discharges is obviously so much more likely to occur with the former than with the latter.

The late Dr. Mullen, of Ladywell Hospital, Salford, followed up all his cases that were discharged at the end of four weeks, irrespective of their skin condition, during the year 1904, and he found that there was no increase in the return case, but rather the reverse. On the other hand, the return case-rate figures for Ladywell Hospital during the years 1917 to 1921 compare somewhat unfavourably with similar* figures for the Monsall Hospital,

* It should be mentioned that the return-case net is smaller meshed in Manchester than in most other places and secondary cases occurring some months after the return of the primary case are regarded as return cases.

Manchester, where patients are not discharged until peeling is complete. In general experience, however, it may be affirmed that where late desquamation is ignored there is no consequential spread of infection. It is evident that there are a few superintendents who, while disbelieving that late desquamation is an infectious process, are disinclined at present to ignore the condition in practice. It seems inadvisable to suggest that there should be any common line of action regarding the discharge or retention of patients in whom desquamation is not completed. So much will depend upon the intelligence and attitude of the local population towards a break with traditional teaching, and upon the personnel of the particular hospital or health department, that it seems best to leave the matter for local decision. Where children are sent home before desquamation is complete it certainly seems advisable that parents should be informed why this has been done.

Final transference of patients to a discharge block is the practice in most of the larger institutions; but in hospitals where the necessary buildings do not exist patients, after being bathed, return to the ward for their last night and, as far as is known, this simpler but less orthodox practice is not followed by any ill-effects.

The general preference shown for the "night-before bath" is in accordance with the recommendations made in the reports to the Metropolitan Asylums Board by Simpson (115) and Cameron (22) and it will be generally admitted that the discharge of a patient on a raw winter's day, an hour or so after he has had a warm bath, is a risky procedure.

While the infection of scarlet fever is certainly derived in most cases direct from another human source it cannot be assumed that it is never retained and transmitted by clothes; it must certainly be safer all round for the hospital, where possible, to deal not only with the patient but also with such clothes as he may have infected during the beginning of his illness.

(10) *Convalescence Away from Home.*—In the past convalescent homes have not fulfilled all that was hoped of them as regards scarlet fever patients. It was hoped that the patients, transferred from the hot-house conditions of hospital life, might be hardened off for the out-of-doors existence in the streets which many would resume on their return home. But it was found that these homes did little to prevent the incidence of infecting cases and as "preparation-for-home-hospitals"* they proved disappointing. With the clinical change that has come over the character of the disease it is doubtful whether in the majority of cases convalescent homes are nowadays needed, because a considerable portion of the time for which uncomplicated cases are retained in most hospitals is really one of convalescence. In those hospitals, too, where open-air methods are adopted as

* F. J. Woollacott: "Return cases of Scarlet Fever." M.A.B. Report, 1906. Med. Suppl. p. 333.

much as possible some preparation is being made for the return to home-life and to the in-and-out-of-doors habit of young children. The provision of covered playgrounds for winter needs would also help considerably in the same direction.

But there will always be a few cases where it is desirable to secure some intermediate hostel and here it seems to us is another reason for the consultation between hospital and health authorities previous to the discharging of patients. A certain proportion (but apparently a small one in these times) of patients will require further hospital or sanatorium treatment on account of complications ; but apart from these there will be other patients, for whom, in the joint opinion of the medical superintendent and the medical officer of health, an immediate return home is inadvisable. For such, admission to a suitable convalescent home may be secured or some domestic arrangement may be made whereby the convalescing child is boarded-out with childless relatives or friends.

(11) *Instructions to Parents on Discharge of Scarlet Fever Patients.*—Where possible it would be an advantage for the responsible guardian to be instructed both by printed matter and by word of mouth and this could well be done (as no doubt it often is) by the medical officer or the matron reading through and explaining the printed instructions as they are handed to the mother. In this connection also we think it would be helpful if a health visitor (or someone acquainted with the homes to which patients were returning), were appointed to attend the hospital on or before discharge day and discuss the circumstances of the patients about to leave hospital. By such an arrangement any matters of importance relating to the illness of particular patients would be made known to the health authorities ; these in their turn, through the health visitor, would acquaint the medical superintendent with any important facts concerning the patients' home conditions. As a result of such collaboration the advice and explanation given to the parent with the printed instructions would often be more personal and pertinent ; and if given in the presence of the health visitor it would be noted by all concerned—patient, parent and health authority—at the same time and for future reference or quotation if necessary. In this way there would be less chance of some "Instructions to Parents" being regarded as counsels of perfection with no particular personal bearing on the individual recipient. Amongst matters which require, and might receive, a personal application not possible in a stereotyped set of instructions may be mentioned the following. The length of time spent in hospital and the course of the disease in individual cases, with consequent advice on the question of returning to school ; advice concerning the possible recrudescence of a particular complication ; explanation concerning a patient discharged before desquamation is complete, etc., etc.

Many matters referred to in the printed instructions are, of course, of general application and as a rule those that were sub-

mitted with the reports were sufficiently comprehensive. Some sets, indeed, would probably gain by being condensed or by having the important points more strongly emphasised. In particular it would be well if in all sets of instructions the attention of parents was drawn to the importance of discharges from the nose and ear, from both the convalescent's point of view and from that of the other members of the household. At the same time, clear instructions about what the parents should do when such sequelae appear are obviously important. The material on which the instructions are printed and the general set-out of the various items are matters of some importance to those for whom the advice is intended. There is much to be said for a stiff card with an eyelet for hanging from a nail which makes it less likely for the list of instructions to become torn or lost ; and in the set-out of the printed matter there is a suitable occasion for employing the various devices adopted by printers for making reading matter arresting and easily apprehended.

Generally speaking, it may be said that in whatever form they are set out these printed instructions should be authoritative, easily read and easily understood ; perhaps there is room for improvement as regards the second of these conditions.

Scarlet Fever Problems in the Home.

(1) *Routine Methods of Home-Treatment and Isolation.*—The frequency with which such ideal conditions as a separate bedroom for the patient and the services of a whole-time nursing attendant are advocated probably reflects the general tendency of reporters to consider home treatment as impracticable in the majority of infected houses. The social conditions of to-day are such that in many a home the mother has neither the available accommodation for an infectious child nor the time, even if she had the capacity, to nurse it. The treatment of scarlet fever in poor overcrowded homes is obviously fraught with grave difficulties even where good outside nursing can be obtained. That such difficulties can, to some extent, be overcome, however, is seen in the examples set by Walsall, Bristol, Tottenham and other places. Unfortunately it appears from many of the reports that there is a special difficulty in obtaining nurses for scarlet fever patients. District Nursing Associations do not wish their nurses to associate with scarlet fever and at the same time it must be admitted that there are at present departmental restrictions against the routine employment of nurses for scarlet fever. For the present type of scarlet fever case good technical nursing is not, perhaps, so essential as it once was and the occasional serious case is in most places sure of admission to hospital. It may be suggested, therefore, that where intelligent supervision with practical help and advice are required more assistance might be looked for from health visitors, voluntary nurses and other social workers.

As regards the printed instructions for the use of parents whose children are being treated at home it is thought that in some cases these might be usefully revised.

(2) *Special Methods of Home-Treatment.*—Inunction methods were adopted as long ago as 1884 when W. A. Jamieson (146) treated his scarlet fever patients in the City Hospital, Edinburgh, with inunctions of carbolic acid and thymol; by this observer the scales were thought to be only infective after the 10th day, but local treatment of the throat with boric acid was commenced early. Curgenven (148a), however, in 1889 insisted that inunction methods, to be successful, should be started in the earliest stages of the disease when the patient was most infectious and this writer considered that eucalyptus oil had both a local and a general antiseptic action to be induced not only by inunction but also by inhalation and ingestion of the drug. In 1894 J. Priestley (161) in his dual capacity of Medical Officer of Health for Leicester and Medical Superintendent of the local fever hospital tested the somewhat extravagant claims of Curgenven by an experiment in which every other hospital patient out of a total of 281 was anointed with a proprietary preparation containing eucalyptus while the remainder of the cases were treated on ordinary lines; the throats of the anointed patients were sprayed with the same preparation. Priestley also considered that the inunction should begin as early as possible though he then suspected that the peeling skin was not so infective as many believed. The Leicester experiment, while failing to substantiate all the previous claims made on behalf of eucalyptus, was considered by its author to have shown that inunction methods were distinctly useful and as Medical Officer of Health for Lambeth Dr. Priestley has reported in the present enquiry that the Milne treatment is useful on occasions.

Then in 1908 Dr. Robert Milne first drew public attention to the "Home Treatment of Scarlet Fever" (163a) by methods which have come to be known as the "Milne Treatment." The ritual of this treatment as expounded by its author is as follows: "The eucalyptus oil must be rubbed carefully all over the body from the crown of the head to the soles of the feet, both morning and evening for the first four days; thence once daily until the ninth day; the throat to be swabbed with carbolic oil, 1 in 10, every 2 hours for the first 24 hours." The fundamental importance of early and thorough treatment was also emphasised by Milne. For this method Milne claimed the following advantages: Isolation of the patient and the subsequent disinfection of his room are unnecessary; the duration of the illness is shortened, while cross-infections, complications and return cases are wholly prevented; economy.

These claims naturally gave rise to much discussion and criticism in medical circles, and the Milne method was put to the test by several authorities concerned with the treatment and control of scarlet fever. The method is still retained by a few of those who were early converted by Dr. Milne's practice and precepts; but the Milne method gained no general acceptance and was largely discredited by the results of trials made in the case of hospital patients in London or else-

where. In the Barnardo Homes, where Dr. Milne, as Medical Officer, originated his treatment, the Milne method became a tradition. This tradition was broken, however, as far as the Girls' Home, Barkingside, is concerned, in 1923, when Dr. Milne's successor reverted to the more orthodox methods of treatment and control. But, meanwhile (April, 1922), the Milne method was started at Tottenham by Dr. Kirkhope under new conditions, not in an institution nor in a hospital, but as a form of home-treatment intended for adoption in the case of the great majority of notified cases and carried out by six specially trained nurses. So far Dr. Kirkhope considers that the Tottenham policy has proved generally satisfactory.* The most recent reference to Milne methods is again from Edinburgh, where Dr. Robertson, in a circular memorandum, alludes to the success of Milne methods in the home treatment of scarlet fever at Leith, and recommends it as a means of securing a greater measure of home-treatment in Edinburgh than has previously been the case. Referring to his experience at Leith, Dr. Robertson adds: "It is not claimed that the Milne treatment can by itself effectually arrest the spread of scarlet fever. It was, nevertheless, a most significant fact that out of 200 consecutive cases of the disease treated in their own homes in Leith, the vast proportion of which were working men's dwellings, not a single instance of spread of infection took place among the other members of the families involved. The apparent efficacy of the Milne treatment strongly suggested that concentration of attention on the patient and the exercise of ordinary care in avoiding, especially, bronchial or nasal contact, were the factors that counted."—(See also Appendix M. No. 24; and Bibl. No. 187f.)

It is probable that a good deal of Dr. Milne's own success was due to the fact that the circumstances of the Barnardo Girls' Home near Ilford made it possible for a patient to be brought under treatment at the very beginning of her illness, and this is rarely possible with patients treated either in hospital or at home Whether the inunction with eucalyptus oil is anything more than a ritual which involves good nursing and special attention seems doubtful; its scientific value obviously depends upon how far the infection of scarlet fever at any stage of a patient's illness is given off by the skin. Local treatment of the throat is also an important part of the authoritative Milne treatment; but many would say that the inunction treatment was excessive or unnecessary; others consider that the throat treatment was not continued for a long enough period. In many instances where the Milne treatment is used to-day the original ritual has certainly been modified: patients are rarely allowed to mix indiscriminately with other children, as Milne allowed, but are isolated during their

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* In his Annual Report for 1925, Dr. Kirkhope writes: "The Council has quite definitely adopted the home-treatment of Scarlet Fever as their policy, except in instances where that is precluded for cogent reasons."

illness; the throat treatment is carried out at longer intervals, but is extended beyond the first 24 hours; terminal disinfection is also carried out in many instances, though not at Tottenham.

It is difficult to escape the suspicion, indeed, that, given good nursing, the Milne treatment—as frequently modified—has little if any advantage over ordinary methods of isolation and symptomatic treatment. It certainly cannot dissipate the necessity of removing to hospital, where possible, all serious cases of scarlet fever; and, judging from the records of Tottenham, the Milne treatment, as carried out among the general population, is by no means unattended (as Milne claimed) by complications and return cases.

But where a treatment, described as the Milne treatment, secures for patients with ordinary attacks of scarlet fever good nursing, or, at any rate, interested attention, then it may be considered a useful auxiliary in the home treatment of scarlet fever.

(3) *Home Visiting of Scarlet Fever Convalescents.*—It is evident that in a great number of districts with well-organised local health services the homes of that section of the public in which infectious diseases are most prevalent are coming more and more under sanitary supervision. The vigilance of nurses, health visitors, after-care committees and other auxiliary forces now employed has enormously strengthened the resources of health authorities in tracking down and checking the incidence of infectious disease. There are references in the reports to the visits paid to houses where patients are being nursed at home and to the domestic inspections of scarlet fever convalescents due to resume school attendance; but it is not quite clear to what extent intermediate home-visiting for the purpose of supervision of convalescent children in households containing susceptible children is carried out in practice.

One result of the supplementary enquiry into the after-histories of scarlet fever patients was to show that the appearance, or re-appearance, of certain forms of illness—including those of an infective nature (sore throat, rhinitis, etc.)—takes place generally within the first two or three weeks after discharge from hospital. It would seem, therefore, that systematic following-up of discharged patients in some cases would be helpful in the early detection of after-illnesses that are of import both to the convalescent and to the susceptible members of the household; such visiting, too, would provide opportunities for emphasising the more important clauses in the instructions commonly issued to parents when their children are discharged from hospital or home-isolation. Possibly, also, there is needed in some districts more liaison between the hospital authorities and the health department whereby the latter could not only be informed of the prospective discharge of scarlet fever patients, but would also be warned about any convalescents whose clinical histories while in hospital suggest that special supervision will be advisable after they have returned home. At the same time, it might be helpful if the hospital

authorities, in their turn, were kept informed of the home conditions of households into which it was proposed to discharge patients; the seeking of information on this point, so it appears from the reports, is already an established custom at certain hospitals.

(4) *Disinfection.*—For comments and conclusions on this subject see PART III (a) and PART IV.

PRACTICE REGARDING THE CONTINUANCE AT, OR RETURN TO SCHOOL, BUSINESS, ETC., OF CONTACTS AND CONVALESCENT RESPECTIVELY.

Rules regarding the exclusion of individuals from school have already been laid down by the Ministry in the recently revised Memorandum on school closure.* In this memorandum it is formulated that, as a general rule, hospital convalescents should not resume school attendance until two weeks after returning home; at the same time it is suggested that an examination of the convalescent by the School Medical Officer, or by an experienced School Nurse or Health Visitor, may sometimes decide the possibility of a child returning to school at the end of a week. Similar rules are applied to the case of patients treated at home, where effective disinfection of rooms has been carried out.

As regards contacts the memorandum states that children living in the same house should be kept away from school for one week from the day on which disinfection, subsequent to the removal of the patient, has taken place. Here, also, an exception is made in the case of those contacts who are known to the School Medical Officer to have already had the disease; "such children may be allowed to return to school immediately after disinfection of the premises." Where the patient is treated at home "no other children from the same house should attend school while the patient is infectious, nor for one week after the end of his period of isolation."

It will be seen that the practices generally described by reporters confirm closely to the rules above quoted; in most respects, however, the time limits allowed in the revised memorandum are, or in some circumstances may be, lower than those most frequently recorded in the questionnaire reports. But as regards contacts of home-treated patients less latitude is allowed in the memorandum than appears to be the case in the current practice of some places where such contacts return to school as soon as the patient is released from isolation. In any case, the comparatively long time for which, at present, it seems necessary that contacts of home-treated patients should remain from school is a serious matter from an educational point of view and is used frequently as an argument against the home treatment of scarlet fever.

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* Memorandum on "Closure and Exclusion from School" (issued jointly by the Ministry of Health and the Board of Education), 1925, pp. 21, 22. Price 4d. net.

PART IV. CONCLUSIONS

The Committee of medical officers of the Ministry which has conferred from time to time regarding the significance of the data obtained in this inquiry has formulated its views on the three matters which formed he main object of the inquiry, as follows :—

A. The customary length of detention of scarlet fever patients in hospital and the effect of a longer or shorter retention of such patients on the occurrence of return cases and complications.

B. The respective advantages and disadvantages of hospital and home treatment.

C. Terminal disinfection in respect of scarlet fever.

A.—Length of Stay in Hospital in Relation to the Occurrence of Return Cases and Complications.

In deciding when a scarlet fever patient should be discharged from hospital most superintendents, we presume, endeavour to release the patient as soon as their experience leads them to believe that he is free from infection and unlikely to give rise to a return case or cases, and when it is hoped also that the patient has recovered and escaped the danger of complications. As the result of general experience, gained in some measure from the time when scarlet fever was a more severe disease than it now is, it has largely become the practice to retain all scarlet fever patients in hospital for a certain minimal length of time which varies in different hospitals from 28 to 42 days and over. In both its policy and practice the Metropolitan Asylums Board apparently favours a longer detention in hospital than is the rule in provincial hospitals. Thus in 1924 the average length of stay of scarlet fever patients varied from 48 days in the North Western Hospital to 67 days in the Brook Hospital ; in 1923 the average length of stay for all the Metropolitan fever hospitals was 56 days whil during the same period the average length of stay in 13 of the provincial hospitals did not exceed 40 days. It will be contended by some that an extended period of hospital treatment and supervision is in the best interests of the patient and that such convalescence in hospital diminishes the risks of late complications such as nephritis. More often, however, the subject of length of stay in hospital has been discussed in relation to its bearing on the incidence of return cases. Some observers such as Neech (94), Cameron (22a) and Turner (127) have contended that a comparatively long stay in hospital decreased the risks of return cases ; on the other hand in his enquiry for the Metropolitan Asylums Board, Simpson did not find that long detention in hospital reduced the chance of return cases. Ewart (39c) from a

statistical study of the subject considered that "every fourth child leaving hospital, irrespective of discharge from nose or throat, is capable of causing further cases even after 6 weeks' detention." From the statistics provided in the present inquiry Dr. Greenwood concludes that increasing the average length of stay in hospital does not diminish the infecting rate.

As a result of some further investigations during the present enquiry it was found that in the great majority of patients complications (including adenitis, otorrhoea and septic conditions) occurred within the first three weeks of hospital isolation, so their incidence cannot be said to be affected by the length of the patient's detention in hospital as no patients receive less than three weeks' treatment and isolation. There is little difference, therefore, between the records of the "short-stay," and those of the "long-stay" hospitals in this respect; indeed, incidence of complications for the former class of hospital case compare favourably with those of the other group. Nor in the matter of return cases and illnesses subsequent to discharge does it appear that the short-stay hospitals as a whole compare unfavourably. It is true that, as a rule, the highest percentages of discharged patients who suffered from sequelae belonged to the group whose previous stay in hospital had been 21 to 28 days and that as the period of detention increased the percentage of patients becoming ill subsequently decreased. The careful survey at Bristol,* however, showed that the majority of the patients in that city who suffered from sequelae, after return to their homes, had been treated in hospital for periods exceeding 41 days.

The late Dr. Claud Ker of Edinburgh, who had been reducing the average length of stay for scarlet fever patients in the Edinburgh City Hospital without ill effects, recommended that short detention methods should be given a prolonged trial. Dr. Harries considers that "the uncomplicated case of scarlet fever can be safely discharged from hospital—desquamating or not—in 30 days from onset." Many more trials are, perhaps, necessary before it is possible to be definite about the comparative disadvantages or advantages of a curtailed period of hospital detention for scarlet fever patients; but it can be said now that trials of this nature, concerning which we have information, do not appear to have been followed by unfavourable results. Taken as a whole, therefore, the records of long-stay hospitals, as shown by the incidence of hospital complications, after-illnesses and return cases, are not more favourable than those for short-stay hospitals.

It appears reasonable to suggest, therefore, that in certain hospitals and in respect of uncomplicated cases a reduction of the traditional period of detention for scarlet fever patients might be attempted without disadvantage.

It is generally agreed that unhealthy conditions of the nose,

* See Appendix I., p. 266.

throat and ear, and other septic conditions, are the most frequent circumstances governing the average length of stay in hospital; and that discharges from the throat and nose (the infectiousness of aural discharges does not appear to us to be fully proved) or other unhealthy conditions of these parts are very often found in those convalescent patients who have been suspected of giving rise to return cases. Measures taken for the prevention or suppression of these local disorders, therefore, may be expected to reduce the average length of stay in hospital and the incidence of return cases. Overcrowding in hospital wards, especially as regards floor space, certainly increases the dissemination of septic infection among patients and is also thought by some observers to be followed, more remotely, by an increase in the incidence of return cases. But overcrowding in many instances could be avoided if cases of scarlet fever were selected, or more carefully restricted, for admission. We think it important that cases should be classified after admission according to their degree of severity and the septic cases segregated wherever possible; the further management of such cases by some form of aseptic nursing and the use of fresh air have proved very successful in some hospitals, notably at the Ham Green Hospital, Bristol.

Regarding the advisability of radically treating in fever hospitals those patients who suffer from diseased conditions of the nose, ear or throat, we do not desire to dogmatise. But the results obtained at three of the Metropolitan Asylums Board hospitals, at Newcastle-on-Tyne, Edinburgh and Birmingham, where a consultant otologist is available, seem to us encouraging. The performance of radical operations in the precincts of a fever hospital have not been found to produce any ill-effects in the hospitals mentioned: on the contrary, there has been a distinct reduction in the average length of stay usual to these chronic cases, and the general average length of stay has been shortened; at Newcastle and Birmingham the appointment of an otologist is said to have resulted already in financial economy.

We conclude that there is no good reason for prescribing a *routine* period of detention in hospital of more than 4 weeks in uncomplicated cases, and that in other cases the period should be based upon the general clinical condition of the patient (presence of discharges, general health, etc.).

We cannot satisfy ourselves that the discharge of patients from hospital in the late stages of desquamation constitutes a danger to public health.

B—The Respective Advantages and Disadvantages of Hospital and Home Treatment.

During recent years there has been an increasing tendency towards institutional treatment for scarlet fever patients, and in the country generally at the present time a very large proportion of the notified cases of this disease are isolated and treated within hospital walls; especially has this been the case in London and in the larger cities.

Inevitably and properly certain questions (but by no means new questions) arise: How do we stand now as regards scarlet fever; has the prevalence of the disease been checked; or has its malignancy in any way been diminished as the result of selecting as promptly as possible from the general population a large proportion of persons affected with scarlet fever, isolating them in specially designed fever hospitals where they would receive expert medical care and nursing, good food and hygienic discipline?

Regarding the prevalence of scarlet fever it is undoubtedly true that the prompt removal of cases to hospital has been followed, not infrequently, by the checking of an outbreak, but the incidence of the disease in the country generally appears to show no marked reduction as the result of hospital isolation or, indeed, of any other measure of public control. The decline in the case-mortality and the decline in the general mortality of scarlet fever are undisputed facts and in themselves most satisfactory. But this decline, as previously pointed out by other observers, began before hospital isolation became at all widespread and continued throughout all parts of the country irrespective of the differences in the quantity and quality of the hospital provision in these several parts. It is not possible to say how far isolation hospitals as a whole have contributed to the decline in scarlet fever mortality which undoubtedly began without their aid. Obviously the death-rate of scarlet fever has declined during the period when hospital isolation has been at its maximum, but it is not possible to say that the death-rate in any particular area has declined in response to such isolation.

As regards the influence of fever hospitals on the incidence of complications it is probably true, as many contend, that under institutional treatment not only are there better chances of apprehending and preventing the onset of complications but that in hospital such complications when they have occurred are more quickly and more adequately treated than at home. But this is countered by others who maintain that the mixing of mild and severe cases of the disease in fever hospitals disposes to cross-infections with other diseases and to aggravation of scarlet fever infection in some who would have passed through a mild uncomplicated attack had they remained in the less dangerous company of their own family.

But if the isolation hospitals have failed to protect the public against attack, it cannot reasonably be doubted that for many years—especially before the type of the disease was quite so mild as it is now and before the present development of health work in the homes—fever hospitals, as treatment centres, have played a valuable part in providing care and treatment for members of the public who have passed through their wards as patients; and this, quite apart from whether in so doing the hospitals have helped to reduce the mortality of the disease or not.

The number of scarlet fever patients, however, who clinically

now require the benefit of hospital treatment, form a very small proportion of those attacked. Never was there less epidemiological evidence nor less clinical necessity for the hospital isolation and treatment of scarlet fever patients than there is to-day; and yet the general hospital-isolating rate for the country as a whole was never so high as it is at the present time. Several factors have probably contributed to this paradox. There is the changed attitude on the part of the public towards isolation hospitals: parents whom it was once necessary to coax in order that their child should be removed to hospital for the care and treatment it so badly needed now require no persuasion; rather it is sometimes necessary to convince them that there is no urgent medical necessity for their children to occupy beds which may be more needed for other purposes.

Again, as the questionnaire reports abundantly show, many public health authorities as well as parents desire to secure hospital accommodation for the great majority of scarlet fever patients. This desire is based on the contention that in the typical industrial town home conditions demand that, as a general rule, cases of scarlet fever should be removed to hospital. Lack of facilities for isolation, overcrowding and nursing difficulties make home treatment, it is said, impossible; some reporters add also that the monetary strain and social hardship involved in retaining a case of infectious disease at home is more than can be borne by many parents.

At the present time, therefore, a large percentage of scarlet fever patients are sent to hospital not primarily in the interest of the public health nor, in many cases, particularly in the clinical interest of the patient, but largely on sociological and compassionate grounds. It is a new situation and one which should be considered by the rate-payer and tax-payer alike. It should be remembered that fever hospitals are primarily medical institutions designed to meet the medical needs of the ratepayers of any particular district; it would be unfortunate if the decision as to what were the *medical* needs of a particular district were not left largely in the hands of its public health and medical advisers. The fact remains that there are districts and towns where, either as a tradition or as an innovation, home-treatment is being adopted without great difficulties, at comparatively little cost and, as far as is known, without harm to the patients or the communities to which they belong. Indeed it may well be asked if the time has not come to consider whether much of the accommodation now set apart for mild cases of scarlet fever could not be better used for other kindred purposes. Considering their needs as patients, the subjects of pneumonia, measles, influenza and encephalitis lethargica have often superior claims upon hospital care and treatment to those of many scarlet fever patients and the stress of nursing such cases at home is often not less, but rather more, than that in scarlet fever. In truth, only a very small proportion of patients suffering from scarlet fever urgently require hospital treatment; and

there are other more important diseases the hospital treatment of which would equally relieve domestic difficulties in the homes which they invade.

Under what circumstances then should scarlet fever patients be selected for hospital treatment? It will be generally agreed that patients who suffer from a severe form of the disease, who are not too ill to be removed, and who cannot be safely treated at home should be admitted to hospital as soon as possible. In the public interest, cases occurring in homes where other members of the family are engaged in milk-selling, clothes-making, etc., etc., should as a rule be isolated in hospital; the same course will be considered appropriate, as a rule, in homes where there are several susceptible school children. There remain in addition those circumstances common in the larger industrial areas where home conditions are utterly unsuitable and where the retention of an infectious case at home may mean loss of work and wages for one or more of the family; here too it is difficult to dissent from the practice of those who remove patients to hospital. But scarlet fever cases are by no means confined to the poorest and most overcrowded homes and, speaking generally, a closer investigation of home conditions and circumstances would probably show that more patients could be treated at home without harm to the public, to their families or to themselves. The further provision or utilisation of nursing facilities would do much to ensure that a patient received the best care and treatment possible in the circumstances of his particular home and would also relieve the mother of much of her additional burden. The case for removal from overcrowded houses will generally be unanswerable.

We conclude then that in any well-ordered public health system both hospital-isolation and home-treatment must play a part and that there is reason to believe that on the whole less attention has been devoted to the possibilities of efficient home-treatment than the evidence we have examined seems to justify.

C. Disinfection.

(*It is to be understood that we refer here to disinfection only in relation to scarlet fever.*)

Many of those who favour terminal disinfection both on principle and in practice, refer to the absence or rare occurrence of secondary cases in houses where disinfection has been carried out. We have compared the results—as measured by the percentage of secondary cases—obtaining in certain towns and districts where traditional measures of disinfection appear to be carried out thoroughly with those of towns and districts where traditional methods have been dropped or materially modified. On the whole it does not appear that there is very much difference in these results.

In Brighton the traditional methods of disinfection were formerly the rule, but these have been gradually superseded so

that during the past three or four years no municipal disinfection has been carried out in the ordinary private home.

No ill-effects have apparently followed Dr. Forbes' experiment in Brighton, and his contention that there is no need for health authorities to spend money in terminal disinfection in private houses where scarlet fever has occurred, appears to be justified. In Willesden, Dr. Buchan's experiments (17) showed that neither steam disinfection nor fumigation nor a combination of these two methods is of any value in controlling the occurrence of secondary cases. There are other instances also where it is reported that the suspension of room disinfection has not been followed by any spread of infection. It seems probable, moreover, that in actual practice the example of Dr. Forbes and others is followed more often than the reports disclose and that in many instances terminal disinfection is a perfunctory performance which is of no more value than doing nothing at all.

Experience with diphtheria, where the organism is known, does not greatly encourage us to hope that a better acquaintance with the scarlet fever virus will result at once in any marked declension of scarlet fever prevalence. In view of the revival of the hypothesis concerning the streptococcal origin of scarlet fever some recent experiments of Dr. Griffith (See Appendix C) are of interest here. Dr. Griffith has confirmed the findings of some American workers that hæmolytic streptococci from the throats of scarlet fever patients may remain viable, up to a period of 50 days, under laboratory conditions closely simulating those that obtain in the sick-room. But, bearing in mind how very seldom scarlet fever infection can even plausibly be attributed to the contamination of inanimate objects by the virus, it does not seem worth while to suggest any more elaborate measures for the disinfection of rooms and furniture at the end of the patient's illness. It seems more rational to practise *current* rather than terminal, disinfection; to sterilise as quickly and as thoroughly as possible all articles exposed to contamination by the patient's discharges, and to observe a careful sick-room regimen during the time that the room is occupied by the patient.* This, after all, is a logical corollary to the aseptic or barrier-nursing of patients in a ward. By means of careful instructions it has been proved possible, as in Brighton, for such

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* There is considerable evidence that opinion abroad concerning terminal disinfection has been changing during recent years and that the utility of this procedure is being seriously questioned. In certain cities of the United States (Providence, New Haven and New York) terminal fumigation has been abandoned; the percentage of secondary cases in New Haven was practically the same as that at Baltimore where fumigation was carefully carried out. (See 113 and 139). Of the United States as a whole, the Acting Surgeon General, Washington, in response to an enquiry from the Director of the Office International d'Hygiène Publique, wrote "When disinfection is done, it is generally felt that particular attention should be given to mechanical cleansing and laundering, boiling and burning such articles as are of little value and not easily disinfected by other means, with possibly the surface disinfection with

articles as bedclothes and personal garments of the patient to be disinfected at home by the housewife and judging by his results there seems no reason why Dr. Forbes' methods should not be tried in other places ; but in the poorer quarters of large districts the imposition of such domestic responsibility may not be always advisable and disinfection by the health authorities will be considered preferable.

As part of the sick-room regimen may be urged the importance, not only of sterilising the food utensils, but also of destroying remnants of food and fluids which have been handled or otherwise contaminated by the patient.

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formaldehyde of such rooms as have been occupied by the patient. The latter is regarded as relatively unimportant and might even be omitted if the other measures are carried out."

In Brazil Dr. Borges Vieira (Ann. Tanlistas d. Med. e Cir. 1923, XIV. No. 10) has recommended that concurrent disinfection should be substituted for terminal disinfection which is considered insignificant if not worthless in the prophylaxy of infectious disease. Ventilation, sunshine and spring-cleaning methods, however, are considered valuable.

In Prussia it was officially decreed in 1923 (74c) that bedside disinfection should be so organised that terminal disinfection would become unnecessary. The regulations enumerate the articles that should be disinfected such as, utensils, body linen, sputum and floor, and for this purpose corrosive sublimate 1 in 1,000 or cresol are recommended ; there are instructions both for the patient and his nurse which aim at preventing the spread of infection from the patient to his nurse and his surroundings. This bedside disinfection is explained and supervised by means of municipal nurses, and only rarely, in overcrowded tenements and such like, is it found expedient to carry out any further disinfection.

In Norway, during recent years, more stress is laid upon "current disinfection" than upon terminal disinfection. In Sweden, on the other hand, the virus of scarlet fever is considered to be particularly resistant and to be conveyed by fomites as often as by direct personal contact ; terminal disinfection, therefore, is officially recommended but so also is "bed disinfection" consisting of the burning of all discharges and the use of 5 per cent. Lysol for all soiled linen and sick-room cleanliness.

In Holland the disinfection of bedclothes, etc., is considered necessary, but not the disinfection of the room. Disinfection of schools is limited to the benches, books and personal accessories. In Amsterdam municipal disinfection is not undertaken except by special request and in other places it is only carried out in order to retain the public's belief in the infectiousness of scarlet fever.

In Denmark disinfection is being gradually given up in many places where the patient is promptly removed to hospital.

APPENDIX A

Report on Certain Statistical Analyses based upon the Committee's Data

By M. Greenwood, F.R.C.P.

INTRODUCTORY NOTE.

The following account summarises certain investigations made in the section of Medical Statistics of the Division of Medical Intelligence and Epidemiology of the Ministry of Health. The calculations have been made under my general supervision by Miss Hilda Woods, a member of the section, and, for Section I, by Major P. G. Edge, an attached worker.

I.—THE RELATION BETWEEN AVERAGE LENGTH OF STAY IN HOSPITAL AND THE PERCENTAGE OF INFECTING CASES DISCHARGED.

The problem proposed was to determine whether, on the average, hospitals discharging cases after relatively long retention showed a smaller proportion of re-infections in the homes or families than hospitals adopting as a routine a shorter period of stay. It was not possible to utilise more than a comparatively small proportion of the returns from Hospital Superintendents owing to differences of definition of an "infecting case." It was, however, found that in 23 hospitals, furnishing in all 256 years' observations, the same definition had been adopted, viz., that an infecting case was one followed by another case in the same family within 28 days of the discharge of the first patient. The two variables, average length of stay in hospital and percentage of infecting cases were correlated, and the result was to find a small but hardly significant positive correlation between the two. There was a slight tendency for the proportion of infecting cases to increase with an increase of average stay in hospital. This investigation, therefore, failed to afford any evidence that prolonged routine stay in hospital diminishes the rate of subsequent infections. In order to check the result and avoid the difficulty of interpretation involved when records from different places are brought together, the records of three hospitals, Norwich, Bedford and Blackburn, which provided data over a long series of years were examined separately by the same method. In each case the result was the same, viz., a positive correlation between the average length of stay in hospital and the infecting case rate. In the Norwich data the increase of infecting case rate with lengthening average stay in hospital was strikingly regular and the positive correlation substantial ($0{\cdot}391 \pm 0{\cdot}024$).

The data, although yielding concordant results, are not numerous enough to justify the decided conclusion that increasing the average retention period will usually increase the infecting case rate, but quite adequate to demonstrate that reductions within the limits of practice of the superintendents supplying data are certainly not associated with more than average infecting case rates. The range of average durations was wide; in 42 per cent. of the observations the mean stay was less than 43 days, and in 15 per cent. more than 50 days. Therefore reduction of the length of stay in many institutions would have such important financial effects, that it is advisable to point out that no statistical disadvantage (in respect of the infecting case rate) can be shown to attach to the attempt to reduce the routine period to 36 days.

II.—THE EFFECT OF ISOLATION UPON THE PREVALENCE AND MORTALITY OF SCARLET FEVER.

This investigation was carried out in great detail. For its purpose only districts were chosen which had either in the period 1906–10 or in 1911–15 returned at least 10 deaths from scarlet fever (the object being to exclude small districts greatly affected by mere random fluctuations)

and in the end 46 County Boroughs and 48 Urban Districts were brought into the study. (Tables 1A and B and Table 2.) Three periods have been investigated. (1906–10, 1911–15 and 1919–23.) The two former periods were chosen in order that the results might be directly comparable with those obtained by Professor Karl Pearson and Miss Elderton in their work on diphtheria. In 1915 these investigators* published a statistical study of the effect upon the prevalence and mortality of diphtheria of modern methods of isolation.

The chief statistical results of this inquiry will be found below; roughly it may be said that Pearson and Elderton were unable to demonstrate any important effect of isolation upon the prevalence or general mortality of the disease, but they were able to show that the case mortality (fatality) was usually negatively correlated with the proportion of cases isolated. The obvious interpretation was that the advantages of clinical handling (use of antitoxin, tracheotomy, etc.) in special hospitals produced this result.

The first question proposed was :—

In districts with a large proportion of isolated cases† does (*a*) the proportion of cases to population, (*b*) the proportion of deaths to population, tend to be low ?

The coefficients of correlation were found to be as follows :—

Correlations.	1st Period.	2nd Period.
Scarlet Fever.—Isolation rate and attack rate	$-\cdot043 \pm \cdot069$	$+\cdot049 \pm \cdot069$
Diphtheria.—Isolation rate and attack rate	$+\cdot427 \pm \cdot063$	$+\cdot291 \pm \cdot069$
Scarlet Fever.—Isolation rate and Death rate	$-\cdot156 \pm \cdot068$	$+\cdot010 \pm \cdot070$
Diphtheria.—Isolation rate and Death rate	$+\cdot153 \pm \cdot075$	$-\cdot012 \pm \cdot075$

In all tables of coefficients of correlation those relating to Scarlet Fever have been computed from the Committee's Data, those relating to Diphtheria have been taken from Pearson and Elderton's memoir.

It will be seen that the correlation of isolation rate and attack rate (Scarlet Fever) is negligibly small, there is *no* general tendency for Scarlet Fever to be less prevalent in districts with a high proportion of isolated cases. Equally there is no significant tendency for the death rate from Scarlet Fever to be lower when the isolation rate is higher. (Chart A.) The second conclusion which is obviously very important, for it suggests that measures of isolation do not diminish the total ultimate loss to the community from the vital statistical point of view, *i.e.*, the proportion of actual deaths to population, has been further tested by ascertaining whether the above total correlation is significantly altered by holding constant both the number of cases of scarlet fever and the population, *i.e.*, we only allow to vary deaths from scarlet fever and number of isolated cases. The effect of this somewhat elaborate calculation is to change (period 1906–10) $-0{\cdot}156 \pm \cdot068$ into $-0{\cdot}155 \pm \cdot068$. This is practically no change at all and it seemed unnecessary to repeat the elaborate computation and sufficient to rely upon the general correlations. When the attack rates but not the populations were held constant the results were :—

Attack rate constant.	1st Period.	2nd Period.
Scarlet Fever.—Isolation and Death rate	$-\cdot163 \pm \cdot068$	$-\cdot040 \pm \cdot069$
Diphtheria.—Isolation and Death rate	$-\cdot204 \pm \cdot074$	$-\cdot305 \pm \cdot068$

* Biometrika, Vol. X., 1914–5, p. 549. The periods used in the study of diptheria were 1904-8 and 1909-12.

† *Isolation rate* has been measured as the average per cent. of cases removed to hospital in each five-year period, *attack rate* as the number of cases per 1,000 of the population, *death rate* as the deaths per 100,000 population and *case mortality* as the deaths per 100 attacked.

The correlations are not significant for either period. When the data for both periods were combined it was found that the general death rate was 9·11 ± 0·306 per 100,000. If the 22 towns with less than 10 per cent. of cases isolated were excluded the mean of the remainder was substantially unchanged, i.e., it became 8·86 ±·309 and the average for the 22 towns with less than 10 per cent. isolation was 11·05 ± 1·16. These three averages are not significantly different. The correlations between death rate and isolation rate were −0·099 ±·049 for the combined data and −0·020 ±0·052 for the data left after excluding the 22 towns with less than 10 per cent. isolated. Both values are insignificant. There is evidently then no statistically measurable relation between the death rate from scarlet fever in a community and the amount of isolation in that community. This result is in full agreement with that of Pearson and Elderton for diphtheria.

Passing to the relation of isolation to case mortality we have:—

	1st Period.		2nd Period.	
Scarlet Fever.—Isolation rate and Case mortality	−·290	±·064	−·194	±·067
Diphtheria.—Isolation rate and Case mortality	−·509	±·057	−·534	±·054
Scarlet Fever.—Attack rate and Case mortality	+·063	±·069	+·203	±·067
Diphtheria.—Attack rate and Case mortality	−·527	±·056	−·495	±·057
Scarlet Fever.—Attack rate and Death rate	+·599	±·045	+·749	±·031
Diphtheria.—Attack rate and Death rate	+·677	±·042	+·688	±·040

Where Isolation is high, *case mortality* tends to be low. (Chart B.) Isolation does not affect attack rate but tends to lessen mortality from the disease.

In the 2nd Period Case Mortality is associated with a high attack rate, but the correlation is only just significant. The following calculations test the possibility of some "spurious" association due to variation of population.

	1st Period.		2nd Period.	
Scarlet Fever.—Population and Attack rate	+·037	±·070	+·175	±·067
Diphtheria.—Population and Attack rate	+·137	±·075	+.054	±·075
Scarlet Fever.—Population and Death rate	+·039	±·069	+.200	±·067
Diphtheria.—Population and Death rate	+·131	±·076	+·116	±·074

Is there any relation between the size of a population and the amount of isolation practised ?

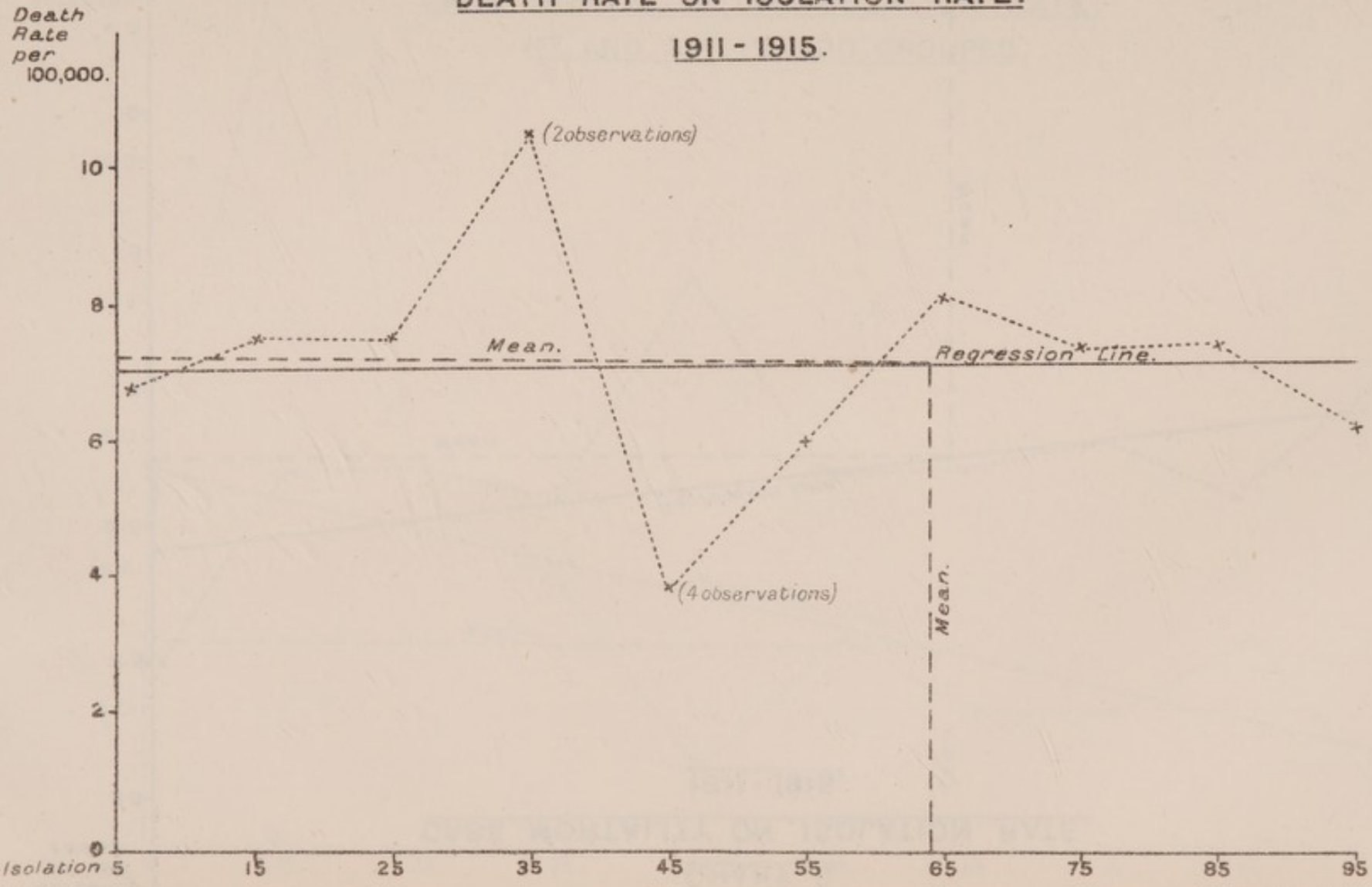
	1st Period.		2nd Period.	
Scarlet Fever.—Population and Isolation rate	+·191	±·067	+·103	±·069
Diphtheria.—Population and Isolation rate	+·152	±·075	+·102	±·075

Hence there is very little, if any, relation between the size of a population and isolation.

CHART A.

DEATH RATE ON ISOLATION RATE.

1911 - 1915.



Mailly & Sons, Lith.

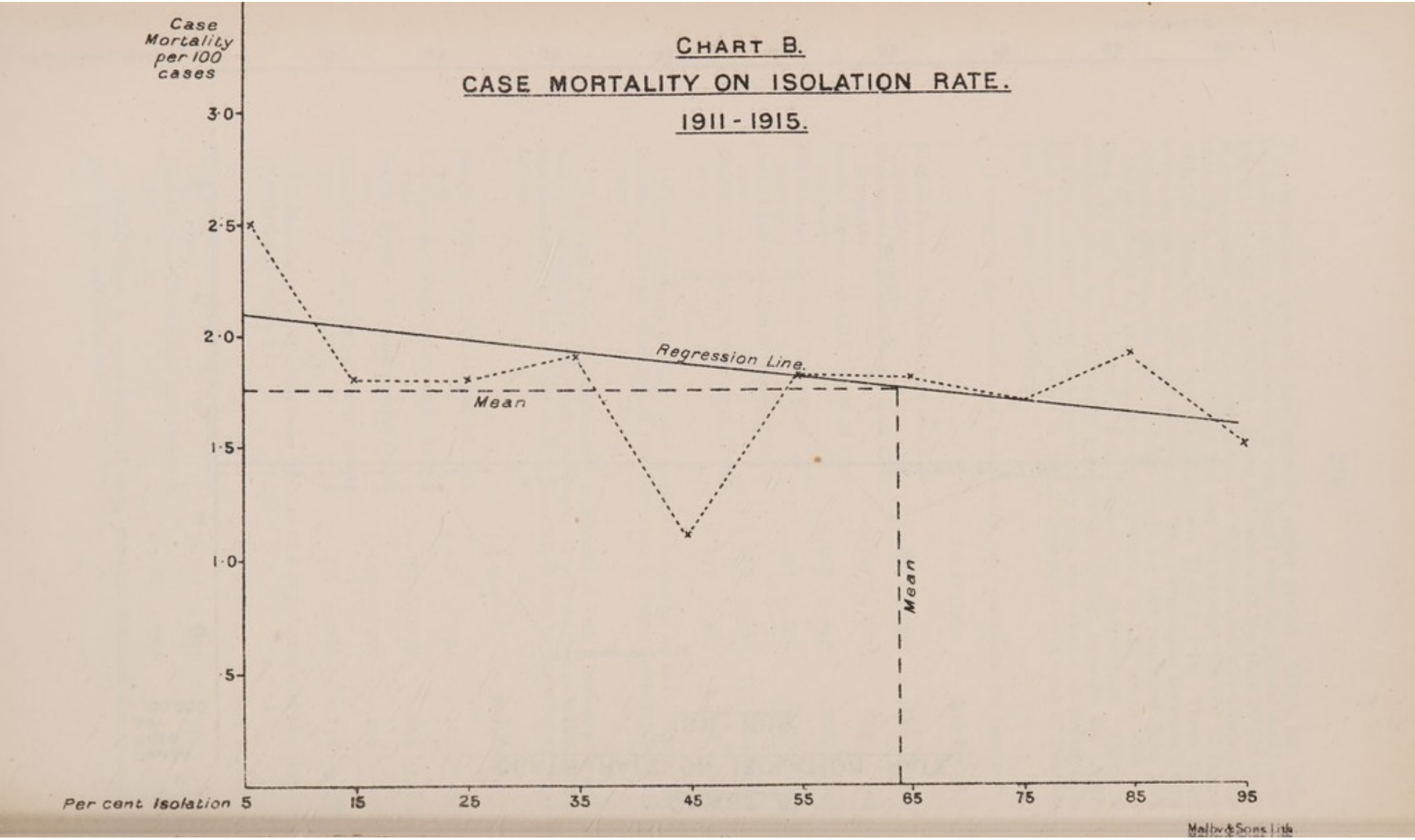
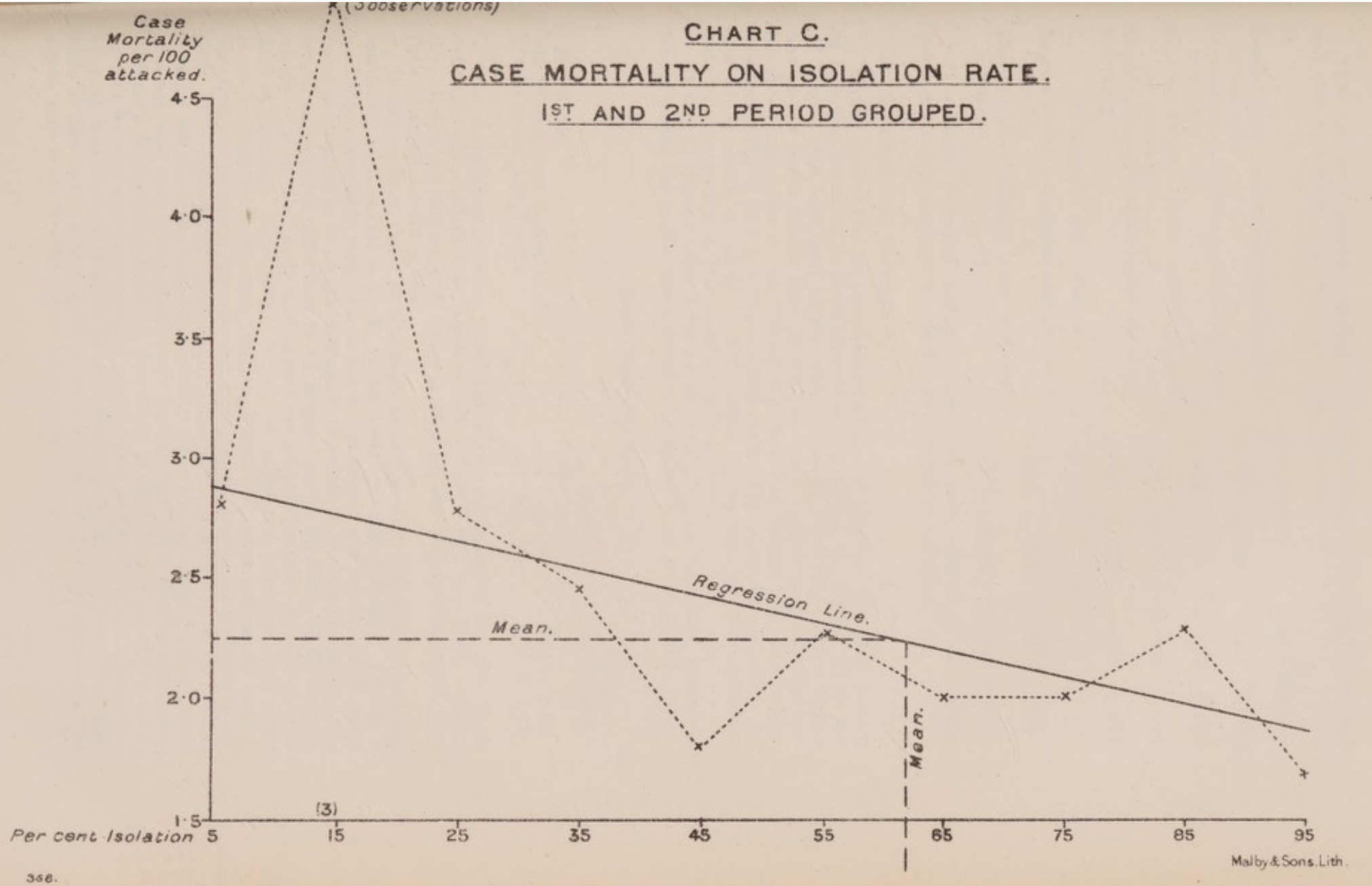

Case Mortality per 100 cases
CHART B.
CASE MORTALITY ON ISOLATION RATE.
1911 - 1915.
3·0
2·5
2·0
1·5
1·0
·5
Regression Line.
Mean
Mean
Per cent Isolation
5
15
25
35
45
55
65
75
85
95
Malby & Sons Lith

CHART C.

CASE MORTALITY ON ISOLATION RATE.

1ST AND 2ND PERIOD GROUPED.



Malby & Sons, Lith.

3se.

Does the *total number attacked*, being a factor of both Isolation rate and case mortality, produce "spurious" correlation?

	1st Period.	2nd Period.
Scarlet Fever.—Total attacked and Isolation rate	+·168 ±·068	+·117 ±·069
Diphtheria.—Total attacked and Isolation rate	+·264 ±·072	+·226 ±·072
Scarlet Fever.—Total attacked and Case mortality	+·007 ±·070	+·153 ±·068
Diphtheria.—Total attacked and Case mortality	−·251 ±·072	−·203 ±·072
For constant No. attacked.		
Scarlet Fever.—Isolation rate and case mortality	−·295 ±·064	−·216 ±·066
Diphtheria.—Isolation rate and case mortality	−·474 ±·056	−·512 ±·057

Correlation between Isolation rate and case mortality is slightly increased where there is no variation in number attacked.

Case Mortality and Isolation.

Taking data of the 1st period and 2nd period together, the Distribution of Isolation tends to be concentrated at one end of the range. There are 22 Towns with less than 10 per cent. isolation. (Table 3.) These Towns have a low mean attack rate of 3·3 per 1,000. (The mean attack rate for the whole series is 1st Period 4·1 and 2nd Period 3·9) and a high case mortality of 28·4 ± 1·97 per 1,000 cases. The mean case mortality for the whole series is 22·45 ±·597. The significance of the difference between the means is measured by 5·95 ± 2·06.

If the 22 Towns with little or no isolation are excluded from the whole series, the mean case mortality is reduced to 21·66 ±·612.

Mean Case Mortality.

	1st Period.	Diff. 2nd Period.
22 Towns	28·4 ± 1·97	
166 Towns (not including 22) ..	21·7 ± ·61	5·87 ± 2·06
Whole series 188 Towns	22·5 ± ·60	6·65 ± 2·06

The correlation between case mortality and isolation for the whole data (1st and 2nd periods together) is −·261 +·046 (η = ·384). (Chart C.) Excluding towns with little or no isolation the correlation is very little changed −·214 ±·050.

It follows from these results that, as in the case of diphtheria but less intensely, high isolation tends to go with low case fatality. This is a perfectly reasonable result since one would expect the conditions of treatment in hospital to be on the average better than in private houses and one would expect this difference to be greater in the handling of diphtheria, where—e.g. in the timely and expert use of tracheotomy—special clinical skill is obviously important. It may be suggested, however, that there is an inconsistency between this conclusion and that previously stated, viz. that the isolation rate was not significantly correlated with the death rate. The explanation is that skilful treatment is only one of the factors making for the reduction of mortality from scarlet fever (or any other disease), and that it is probably only a small factor, i.e. that in a majority of deaths from scarlet fever no variations of clinical skill affect the issue. In fact we may say that what has been proved is that the effect of isolation is good, inasmuch as it tends to the reduction of fatality, but the magnitude of this factor with respect to the totality of factors influencing the death rate from Scarlet Fever is very small.

The following calculations relate to the possible influence of general social conditions:—

	1st Period.	2nd Period.
Scarlet Fever.—'Poverty'(per cent.overcrowding) and Attack rate 1911 ..	−·122 ±·069	+·102 ±·069
Diphtheria.—'Poverty'(per cent. overcrowding) and attack rate 1911 ..	−·153 ±·075	−·136 ±·074
Scarlet Fever.—'Poverty' (per cent. overcrowding) and Death rate ..	+·195 ±·067	+·283 ±·064
Diphtheria.—'Poverty' (per cent. overcrowding) and Death rate	+·061 ±·079	+·004 ±·075
Scarlet Fever.—'Poverty' (per cent. overcrowding) and Isolation rate ..	−·109 ±·069	+·106 ±·069
Diphtheria.—'Poverty' (per cent.overcrowding) and Isolation rate ..	−·236 ±·073	−·235 ±·071

'Poverty' and Death rate from Scarlet Fever is the only significant correlation. Towns with more overcrowding have a higher death rate from Scarlet Fever, or the worse the social conditions the greater the number of deaths from Scarlet Fever.

	2nd Period.
Scarlet Fever.—Infant Mortality and Attack rate.. ..	+·063 ±·069
Diphtheria.—Infant Mortality and Attack rate ..	−·206 ±·072
Scarlet Fever.—Infant Mortality and Death rate ..	+·289 ±·064
Diphtheria.—Infant Mortality and Death rate	+·118 ±·074
Scarlet Fever.—Infant Mortality and Isolation rate ..	−·247 ±·067
Diphtheria.—Infant Mortality and Isolation rate ..	−·375 ±·065

Infant mortality and death rate is significant. More isolation is practised in Towns with a low Infant Mortality.

Conclusions.

1. There is no evidence that greater Isolation reduces the number attacked.
2. Case mortality is somewhat decreased where Isolation is high.
3. The General Death rate from Scarlet Fever is not significantly reduced by greater Isolation.
4. The Death rate from Scarlet Fever is higher in Towns with bad social conditions.*

* Since this report was prepared for press we have received a copy of the Annual Report for 1925 of the Isle of Wight County Medical Officer of Health. Dr. Fairley, from a comparison of the experience of various administrative divisions of the island before and after the provision of isolation hospitals, reaches the conclusion that, neither in respect of attack, death or fatality rates, has the provision of isolation hospitals influenced Scarlet Fever.

Table Ia.

County Boroughs.	1906–10. Overcrowding per cent. more than 2 per room, 1911.	Total Population.	Total Cases.	Attack rate per 1,000.	Cases to Hospital.	Isolation rate per cent.	Deaths.	Fatality rate per 1,000.	Death rate per 100,000.	1911–15. Total Population.	Total Cases.	Attack rate per 1,000.	Cases to Hospital.	Isolation rate per cent.	Deaths.	Fatality rate per 1,000.	Death rate per 100,000.	Average Infantile Mortality of 1911–1915.
Leicester ..	1·1	1,113,000	7,998	7·2	5,438	68·0	35	4·4	3·1	1,150,000	4,114	3·6	2,686	65·3	41	10·0	3·6	120·4
Bath	4·8	252,300	413	1·6	338	81·8	6	14·5	2·4	344,993	1,130	3·28	840	74·3	11	9·7	3·2	79·8
Norwich ..	3·2	550,451	2,318	4·2	1,924	83·0	37	16·0	6·7	569,465	2,606	4·58	1,905	73·1	53	20·3	9·3	116·2
East Ham ..	6·4	611,235	3,775	6·2	2,254	59·7	82	21·7	13·4	677,195	2,514	3·71	1,996	79·4	30	11·9	4·4	81·8
Southend ..	3·6	262,760	855	3·3	764	89·4	8	9·4	3·0	356,765	698	1·96	583	83·5	9	12·9	2·5	84·0
Exeter ..	4·8	240,720	540	2·2	470	87·0	13	24·0	5·4	266,878	754	2·83	578	76·7	9	11·9	3·4	98·4
Worcester ..	4·9	238,010	616	2·6	537	87·2	8	13·0	3·4	241,086	562	2·33	494	87·9	8	14·2	3·3	89·4
Birmingham ..	10·2	2,625,184	12,191	4·6	10,000	82·0	395	32·4	15·0	3,022,775	25,952	8·59	18,275	70·4	603	23·2	19·9	130·6
Coventry ..	5·3	456,500	2,702	5·9	2,183	80·8	105	38·9	23·0	575,502	3,575	6·21	2,812	78·7	116	32·4	20·2	89·4
Burton-on-Tr't	1·5	244,510	828	3·4	697	84·2	19	22·9	7·8	241,971	910	3·71	732	80·4	9	9·9	3·7	88·4
Smethwick ..	5·7	343·800	2,418	7·0	729	30·1	53	21·9	15·4	362,403	1,756	4·85	934	53·2	40	22·8	11·0	120·4
Walsall ..	7·2	452,115	2,101	4·6	3	0·1	57	27·1	12·6	465,444	884	1·90	0	0	10	11·3	2·1	142·0
Northampton..	1·1	445,745	2,544	5·7	1,701	66·9	23	9·0	5·2	451,150	1,896	4·20	1,180	62·2	17	9·0	3·8	103·4
Oxford ..	2·4	261,170	724	2·8	577	79·7	13	18·0	5·0	270,190	279	1·03	219	78·5	1	3·6	0·4	80·8
Eastbourne ..	4·3	249,228	746	3·0	736	98·7	4	5·4	1·6	272,172	1,051	3·86	1,043	99·2	12	11·4	4·4	81·4
Hastings ..	5·5	314,500	752	2·4	648	86·2	16	21·2	5·1	311,075	430	1·38	374	87·0	3	7·0	0·96	84·8
Portsmouth ..	2·3	1,095,695	3,703	3·4	2,269	61·3	64	17·3	5·8	1,158,477	5,016	4·33	3,166	63·1	98	19·5	8·5	95·4
Bournemouth..	1·5	366,940	688	1·9	638	92·7	9	13·1	2·5	408,489	699	1·71	649	92·8	7	10·01	1·7	80·2
Nottingham ..	4·3	1,269,290	3,355	2·6	1,927	57·4	57	17·0	4·5	1,306,020	4,792	3·67	2,512	52·4	76	15·9	5·8	137·2
Darlington ..	12·9	262,860	622	2·4	573	92·1	13	20·9	4·9	290,071	1,787	6·16	1,670	93·5	49	27·4	16·9	105·0
Gateshead ..	33·7	574,690	1,154	2·0	399	34·6	39	33·8	6·8	595,120	1,945	3·27	1,139	58·6	38	19·5	6·4	133·0
South Shields	32·9	531,555	1,559	2·9	1,194	76·6	49	31·4	9·2	551,225	3,489	6·33	2,350	67·4	79	22·6	14·3	129·8
York	6·5	404,865	1,057	2·6	606	57·3	15	14·2	3·7	413,170	1,373	3·32	756	55·1	13	9·5	3·1	109·0
Barnsley ..	10·0	238,774	921	3·9	752	81·7	43	46·7	18·0	256,111	685	2·67	613	89·5	27	39·4	10·5	155·2

TABLE Ia—*continued.*

County Boroughs.	1906–10. Overcrowding per cent. more than 2 per room, 1911.	1906–10. Total Population.	1906–10. Total Cases.	1906–10. Attack rate per 1,000.	1906–10. Cases to Hospital.	1906–10. Isolation rate per cent.	1906–10. Deaths.	1906–10. Fatality rate per 1,000.	1906–10. Death rate per 100,000.	1911–15. Total Population.	1911–15. Total Cases.	1911–15. Attack rate per 1,000.	1911–15. Cases to Hospital.	1911–15. Isolation rate per cent.	1911–15. Deaths.	1911–15. Fatality rate per 1,000.	1911–15. Death rate per 100,000.	Average Infantile Mortality of 1911–1915.
Halifax ..	12·0	502,024	2,238	4·5	1,433	64·0	63	28·1	12·5	521,300	1,345	2·58	835	62·1	26	19·3	5·0	101·0
Leeds	11·0	2,202,870	5,625	2·6	4,663	82·9	155	27·6	7·0	2,240,430	6,971	3·11	6,214	89·1	161	23·1	7·2	129·6
Sheffield ..	8·4	2,208,397	11,533	5·2	8,379	72·7	82	7·1	3·7	2,346,870	11,925	5·08	9,315	78·1	281	23·6	12·0	127·8
Wakefield ..	12·1	221,415	471	2·1	207	43·9	13	27·6	5·9	259,640	508	1·96	312	61·4	8	15·7	3·1	114·0
Tynemouth ..	30·8	282,905	709	2·5	272	38·4	29	40·9	10·3	299,050	1,037	3·47	717	69·1	26	25·1	8·7	123·0
Stockport ..	5·4	511,740	1,892	3·7	1,166	61·6	46	24·3	9·0	571,626	1,712	2·99	1,326	77·5	27	15·8	4·7	135·4
Chester ..	8·0	195,199	1,425	7·3	857	60·1	28	19·7	14·3	198,935	300	1·51	265	88·3	3	10·0	1·5	104·4
Wolverhampton	5·0	474,919	1,965	4·1	1,640	83·5	62	31·6	13·1	485,310	1,393	2·87	1,212	87·0	20	14·4	4·1	119·6
Blackpool ..	4·2	275,310	1,127	4·1	998	88·6	27	24·0	9·8	307,285	730	2·38	656	89·9	8	11·0	2·6	117·4
Bootle ..	9·2	332,400	1,778	5·3	1,257	70·7	60	33·7	18·1	355,990	1,038	2·92	794	76·5	21	20·2	5·9	134·0
Burnley ..	9·5	518,521	2,139	4·1	987	46·1	78	36·5	15·0	536,936	1,305	2·43	676	51·8	27	20·7	5·0	170·8
Liverpool ..	10·1	3,690,101	18,256	4·9	14,698	80·5	948	51·9	25·7	3,816,349	15,391	4·03	12,784	83·1	466	30·3	12·2	137·2
Manchester ..	7·3	3,485,789	14,734	4·2	9,689	65·8	398	27·0	11·4	3,587,847	15,128	4·22	9,439	62·4	285	18·8	7·9	133·0
Oldham ..	7·2	723,205	2,652	3·7	1,516	57·2	98	37·0	13·6	739,310	3,530	4·77	2,190	62·0	96	27·2	13·0	136·6
Rochdale ..	7·0	444,701	1,241	2·8	822	66·2	42	33·8	9·4	458,448	1,936	4·22	1,395	72·1	33	17·0	7·2	121·0
St. Helens ..	17·0	464,544	2,857	6·2	2,326	81·4	98	34·3	21·1	491,101	2,922	5·95	2,528	86·5	79	27·0	16·1	140·2
Warrington ..	10·7	350,010	1,217	3·5	852	70·01	56	46·0	16·0	368,115	2,573	6·99	1,803	70·1	74	28·8	20·1	118·8
Blackburn ..	4·4	659,458	3,796	5·8	2,738	72·1	154	40·6	23·4	661,610	1,891	2·86	1,435	75·9	31	16·4	4·7	143·6
Barrow ..	8·7	309,560	911	2·9	39	4·3	14	15·4	4·5	329,330	1,264	3·84	188	14·9	20	15·8	6·1	112·2
Bolton ..	7·7	887,000	3,799	4·3	2,321	61·1	130	34·2	14·7	905,366	2,040	2·25	1,055	51·7	43	21·1	4·7	128·8
Wigan ..	12·9	435,595	1,776	4·1	889	50·1	49	27·6	11·2	446,054	2,219	4·97	1,296	58·4	34	15·3	7·6	160·4
Cardiff ..	4·7	885,809	3,704	4·2	2,842	76·7	60	16·2	6·8	930,906	4,684	5·03	3,102	66·2	72	15·4	7·7	115·2

Table Ib.

Urban Districts and Boroughs. Selection.—Not less than 10 deaths in either period.	1906–10. Overcrowding per cent. more than 2 per room, 1911.	Total Population.	Total Cases	Attack rate per 1,000.	Cases to Hospital.	Isolation rate per cent.	Deaths.	Fatality rate per 1,000.	Death rate per 100,000.	1911–15. Total Population.	Total Cases.	Attack rate per 1,000.	Cases to Hospital.	Isolation rate per cent.	Deaths.	Fatality rate per 1,000.	Death rate per 100,000.	Average Infantile Mortality, 1911–15.
Cumberland—																		
Carlisle	18·1	249,980	1,303	5·2	747	57·3	23	17·7	9·2	256,297	1,234	4·81	805	65·1	23	18·6	9·0	129·6
Staffordshire—																		
Newcastle-under-Lyme	9·4	100,585	237	2·4	142	59·9	10	42·1	9·9	101,225	253	2·50	202	79·8	6	23·7	5·9	138·6
Wednesbury ..	9·8	137,175	672	4·9	2	·3	20	29·8	14·6	143,510	150	1·05	3	2·0	6	40·0	4·2	133·2
Wolstanton	7·3	129,740	426	3·3	270	63·4	7	16·4	5·4	138,579	762	5·50	642	84·3	16	21·0	11·5	120·8
Lancashire—																		
Chadderton	6·4	136,406	456	3·3	52	11·4	19	41·7	13·9	142,601	543	3·81	186	34·3	12	22·1	8·4	123·6
Droylsden	6·4	63,053	529	8·4	26	4·9	18	34·0	28·5	66,915	239	3·57	51	21·3	4	16·7	6·0	123·6
Eccles	3·6	201,500	803	4·0	178	22·2	26	32·4	12·9	213,000	663	3·11	155	23·4	10	15·1	4·7	108·8
Horwich	5·3	79,615	584	7·3	472	80·8	25	42·8	31·4	80,760	426	5·27	305	71·6	11	25·8	13·6	92·0
Nelson	3·7	187,390	776	4·1	6	·8	21	27·1	11·2	198,605	566	2·85	19	3·4	9	15·9	4·5	95·2
Rawtenstall	9·5	153,383	417	2·7	0	0	8	19·2	5·2	151,032	475	3·15	31	6·5	18	37·9	11·9	109·8
Stretford	1·6	194,390	874	4·5	465	53·2	26	29·7	13·4	216,520	849	3·92	464	54·7	10	11·8	4·6	90·8
Waterloo-with-Seafrth	4·4	127,025	549	4·3	235	42·8	16	29·1	12·6	135,215	525	3·88	244	46·5	8	15·2	5·9	93·6
Cheshire—																		
Crewe	4·0	220,471	1,163	5·3	1,035	89·0	20	17·2	9·1	226,337	792	3·50	687	86·7	15	18·9	6·6	111·8
Hyde	4·5	172,159	960	5·6	859	89·5	33	34·4	19·2	167,896	726	4·32	667	91·9	19	26·2	11·3	149·8
Macclesfield ..	3·3	169,790	972	5·7	685	70·5	18	18·5	10·6	167,770	1,039	6·19	680	65·4	22	21·2	13·1	127·0
Stalybridge	5·0	134,305	448	3·3	3	·7	17	37·9	12·7	131,285	336	2·56	24	7·1	12	35·7	9·1	162·2
Bedford—																		
Bedford	0·8	189,860	491	2·6	391	79·6	10	20·4	5·3	196,975	790	4·01	611	77·3	10	12·7	5·1	87·6
Surrey—																		
Wimbledon	4·0	271,000	1,110	4·1	796	71·7	15	13·5	5·5	286,209	872	3·05	648	74·3	6	6·9	2·1	84·6

TABLE IB—*continued.*

Urban Districts and Boroughs. Selection.—Not less than 10 deaths in either period.	1906-10. Overcrowding Per cent. more than 2 per room, 1911.	Total Population.	Total Cases.	Attack rate per 1,000.	Cases to Hospital.	Isolation rate. per cent.	Deaths.	Fatality rate per 1,000.	Death rate per 100,000.	1911-1915. Total Population.	Total Cases.	Attack rate per 1,000.	Cases to Hospital.	Isolation rate per cent.	Deaths.	Fatality rate per 1,000.	Death rate per 100,000	Average Infantile Mortality. 1911-15.
Notts—																		
Arnold	3·9	52,120	132	2·5	8	6·1	6	45·5	11·5	56,380	371	6·58	15	4·0	10	27·0	17·7	123·6
Worksop	5·3	95,577	534	5·6	379	71·0	18	33·7	18·8	105,697	486	4·60	305	62·8	4	8·2	3·8	98·0
Derby—																		
Ilkeston	5·8	158,382	114	0·7	13	11·4	10	87·7	6·3	160,172	271	1·69	190	70·1	1	3·7	·6	142·0
Leicester—																		
Hinckley	2·8	61,875	259	4·2	207	79·9	2	7·7	3·2	65,280	540	8·27	205	38·0	13	24·1	19·9	106·4
Gloucester—																		
Cheltenham ..	2·9	245,464	381	1·6	322	84·5	1	2·6	·4	244,206	1,151	4·71	1,045	90·8	12	10·4	4·9	90·8
Warwick—																		
Sutton Coldfield ..	2·1	92,930	252	2·7	135	53·6	11	43·7	11·8	103,550	516	4·98	221	42·8	6	11·6	5·8	68·4
Worcester—																		
Oldbury	9·6	142,900	860	6·0	228	26·5	31	36·0	21·7	169,282	484	2·86	222	45·9	6	12·4	3·5	138·4
Stourbridge	6·9	85,045	519	6·1	425	81·9	12	23·1	14·1	87,290	297	3·40	236	79·5	4	13·5	4·6	100·6
Northants—																		
Kettering	1·2	147,898	1,180	8·0	509	43·1	11	9·3	7·4	149,960	1,182	7·88	519	43·9	3	2·5	2·0	101·6
Peterborough ..	1·1	164,070	601	3·7	440	73·2	7	11·6	4·3	170,552	606	3·55	433	71·5	11	18·2	6·4	95·4
Durham—																		
Blaydon-on-Tyne ..	41·2	138,476	552	4·0	393	71·2	18	32·6	13·0	158,240	855	5·40	664	77·7	20	23·4	12·6	147·8
Felling-on-Tyne ..	37·0	133,762	618	4·6	0	0	43	69·6	32·1	128,109	491	3·83	424	86·4	20	40·7	15·6	122·2
Jarrow	37·8	161,553	221	1·4	155	70·1	7	31·7	4·3	168,097	996	5·92	832	83·5	14	14·1	8·3	145·0
West Yorks—																		
Batley	19·3	172,870	298	1·7	60	20·1	12	40·3	6·9	181,735	336	1·85	282	83·9	5	14·9	2·8	139·2
Bingley	7·2	93,465	222	2·4	190	85·6	6	27·0	6·4	94,245	560	5·94	495	88·4	11	19·6	11·7	82·2
Keighley	9·0	214,546	836	3·9	745	89·1	15	17·9	7·0	216,510	1,236	5·71	1,078	87·2	38	30·7	17·6	124·2

Lancashire—																			
Accrington	3·8	223,147	661	3·0	3	·5	9	13·6	4·0	224,968	489	2·17	4	·8	10	20·4	4·5	139·2
Audenshaw	6·5	39,755	246	6·2	9	3·7	10	40·7	25·2	39,958	197	4·93	16	8·1	1	5·1	2·5	132·6
Rawmarsh	7·2	82,039	391	4·8	276	70·6	13	33·2	15·8	87,000	590	6·78	476	80·7	13	22·0	14·9	147·4
Middlesex—																			
Acton	10·4	257,850	1,498	5·8	1,187	79·2	47	31·4	18·2	291,285	1,043	3·58	778	74·6	16	15·3	5·5	99·0
Brentford	8·9	80,785	450	5·6	406	90·2	16	35·6	19·8	83,360	373	4·47	344	92·2	1	2·7	1·2	115·8
Chiswick	8·8	180,405	653	3·6	486	74·4	10	15·3	5·5	196,020	532	2·71	368	69·2	12	22·6	6·1	87·6
Ealing	3·8	263,840	723	2·7	574	79·4	5	6·9	1·9	312,643	1,607	5·14	1,331	82·8	11	6·8	3·5	79·4
Edmonton	10·6	297,145	1,361	4·6	1,209	88·8	42	30·9	14·1	325,995	1,341	4·11	1,231	91·8	13	9·7	4·0	108·4
Enfield	4·8	261,325	1,253	4·8	1,077	86·0	38	30·3	14·5	286,120	736	2·57	642	87·2	13	17·7	4·5	94·0
Finchley	4·4	171,156	582	3·4	421	72·3	15	25·8	8·8	204,392	597	2·92	445	74·5	5	8·4	2·5	66·4
Hornsey	3·2	406,275	1,327	3·3	896	67·5	20	15·1	4·9	425,810	1,051	2·47	742	70·6	8	7·6	1·8	69·6
Willesden	13·9	741,411	2,967	4·0	2,562	86·3	60	20·2	8·1	813,558	2,478	3·05	2,133	86·1	33	13·3	4·1	92·0
Wales—																			
Pontypridd	4·0	199,650	794	4·0	0	0	22	27·7	11·0	219,900	870	3·96	4	·5	15	17·2	6·8	135·0
Rhondda	5·6	705,336	3,272	4·6	298	9·1	64	19·6	9·1	773,841	4,157	5·37	1,194	28·7	81	19·5	10·5	136·0

TABLE 2.

Scarlet Fever.

(94 obs.) *Means and Standard Deviations.*

—	1906–10		1911–15	
	Mean.	S.D.	Mean.	S.D.
Isolation rate per 100 cases ..	60·11	28·35	64·68	25·41
Case mortality per 1,000 cases ..	26·91	13·51	17·98	8·48
Death rate per 100,000 pop. ..	11·01	6·79	7·21	4·78
Attack rate per 1,000 pop. ..	4·12	1·63	3·87	1·57
Population (5 years)	457,447	644·37	474,468	673·66
Total attacked (5 years) ..	1877·66	2939·04	2005·32	3528·56
Per cent. overcrowding (more than 2 persons in a room) (1911) ..	8·49	8·07	—	—
Infant mortality per 1,000 births (1911–15)	114·47	23·72	—	—
	1906–15			
1st and 2nd period together.				
Isolation rate	62·45	27·05	—	—
Case mortality	22·45	12·13	—	—
Death rate	9·11	6·23	—	—
Excluding towns with under 10 per cent. isolation.				
Isolation rate	70·06	18·26	—	—
Case mortality	21·66	11·69	—	—
Death rate	8·86	5·90	—	—

TABLE 3.

Towns with less than 10 per cent. isolation.

	1st Period.	2nd Period.
Barrow	,,	—
Walsall	,,	,,
Wednesbury	,,	,,
Droylsden	,,	—
Nelson	,,	,,
Rawtenstall	,,	,,
Stalybridge	,,	,,
Arnold	,,	,,
Felling-on-Tyne	,,	—
Accrington	,,	,,
Audenshaw	,,	,,
Pontypridd	,,	,,
Rhondda	,,	—

So far no reference has been made to the results of analysing data of years more recent than 1915 because it seemed desirable to keep steadily in view the comparison between the results for scarlet fever and for diphtheria, and Professor Pearson and Miss Elderton's study of the latter did not, of course, include the latest returns.

In the following tables 4, 5, 6 (*a*) and 6 (*b*) are set out the necessary particulars for scarlet fever in 1919–23, and a complete view of the different constants for all three epochs.

TABLE 4.

Scarlet Fever.

Means and Standard Deviations.

Variables.	1906–10		1911–15		1919–23	
	Mean.	S.D.	Mean.	S.D.	Mean.	S.D.
Isolation rate per 100 cases.. ..	60·1	28·35	64·7	25·41	68·3	23·63
Case mortality per 1,000 cases ..	26·9	13·51	17·98	8·48	11·49	6·96
Death rate per 100,000 population	11·0	6·79	7·21	4·78	3·27	2·45
Attack rate per 1,000 population..	4·1	1·63	3·87	1·56	2·85	1·12

	Mean.	S.D.
Per cent. overcrowding 1911	8·49	8·07
„ „ „ 1921	9·77	8·59
Infant Mortality 1911–15..	114·47	23·72
„ „ 1919–23..	75·96	15·32

TABLE 5.

Scarlet Fever. 94 C.Bs. and Urban Districts.

COEFFICIENTS OF CORRELATION.

—	1906–10.	1911–15.	1919–23.
Isolation rate and Attack rate ..	− ·043 ± ·069	+ ·049 ± ·069	− ·108 ± ·069
Isolation rate and Death rate ..	− ·156 ± ·068	− ·010 ± ·070	+ ·063 ± ·069
Partial Correlations.			
Isolation rate and Death rate. Attack rate constant.	− ·163 ± ·068	− ·040 ± ·069	+ ·159 ± ·068
Isolation rate and Case mortality	− ·290 ± ·064	− ·194 ± ·067	+ ·149 ± ·068
Attack rate and Case mortality ..	+ ·063 ± ·069	+ ·203 ± ·067	+ ·095 ± ·069
Attack rate and Death rate ..	+ ·599 ± ·045	+ ·749 ± ·031	+ ·594 ± ·045
Population and Attack rate ..	+ ·037 ± ·070	+ ·175 ± ·067	+ ·253 ± ·065
Population and Isolation rate ..	+ ·191 ± ·067	+ ·103 ± ·069	+ ·066 ± ·069
Population and Death rate ..	+ ·039 ± ·069	+ ·200 ± ·067	+ ·221 ± ·066
Total attacked and Isolation rate	+ ·168 ± ·068	+ ·117 ± ·069	+ ·038 ± ·069
Total attacked and Case mortality	+ ·007 ± ·070	+ ·153 ± ·068	+ ·108 ± ·069
Partial Correlations.			
Isolation rate and Case mortality. Constant number attacked.	− ·295 ± ·064	− ·216 ± ·066	+ ·154 ± ·068
Death rate and Isolation. Attack rate and overcrowding constant.	− ·212 ± ·066	+ ·037 ± ·069	− ·002 ± ·070
"Poverty," Percentage Overcrowding and Attack rate.	− ·122 ± ·069	+ ·102 ± ·069	+ ·093 ± ·069
"Poverty," Percentage Overcrowding and Death rate.	+ ·195 ± ·067	+ ·283 ± ·064	+ ·250 ± ·065
"Poverty," Percentage Overcrowding and Isolation rate.	− ·109 ± ·069	+ ·106 ± ·069	+ ·208 ± ·067
	1911–15.	1919–23.	
Infant Mortality and Attack rate	+ ·063 ± ·069	+ ·004 ± ·070	
Infant Mortality and Death rate	+ ·289 ± ·064	+ ·437 ± ·063	Diff. ·149 ± ·096 not sig.
Infant Mortality and Isolation rate	− ·247 ± ·067	− ·066 ± ·069	

Note.—1919–23. There were 45 County Boroughs and 49 Urban Districts. For seven of the C.Bs. there was only information for 1919–22, and in one Urban District for 1919–21 Overcrowding index for 1919–23 was taken from the 1921 census. Infant mortality was the mean of 1919–23.

TABLE 6(*a*).

COUNTY BOROUGHS, 1919–23.

—	Total population.	Total cases.	Attack rate per 1,000.	Cases to hospital.	Isolation rate per cent.	Total deaths.	Fatality rate per 1,000.	Death rate per 100,000.	Mean 1919–23 Infant mortality.	1921 percentage overcrowding.
Leicester* ..	953,000	2,858	3·0	2,012	70·4	11	3·9	1·15	89·2	2·9
Bath	342,460	456	1·3	355	77·9	2	4·4	0·58	54·6	3·8
Norwich ..	603,264	2,207	3·7	1,790	81·1	18	8·2	2·98	74·4	5·1
East Ham ..	718,812	3,275	4·6	1,969	60·1	10	3·1	1·39	61·0	7·8
Southend ..	524,887	1,440	2·7	1,055	73·3	5	3·5	0·95	53·4	6·9
Exeter	298,833	315	1·1	258	81·9	2	6·3	0·67	73·8	5·1
Worcester ..	245,804	340	1·4	276	81·2	0	0	0	62·6	5·4
Birmingham ..	4,597,216	17,573	3·8	11,655	66·3	270	15·4	5·87	82·4	10·2
Coventry ..	653,657	1,206	1·8	935	77·5	19	15·8	2·91	75·0	6·7
Burton-on-Trent	245,834	686	2·8	571	83·2	5	7·3	2·03	75·2	3·0
Smethwick ..	382,017	1,562	4·1	752	48·1	16	10·2	4·19	81·6	8·9
Walsall ..	484,628	835	1·7	28	3·4	8	9·6	1·65	102·2	10·8
Northampton ..	454,475	957	2·1	604	63·1	9	9·4	1·98	67·0	2·7
Oxford	281,996	590	2·1	456	77·3	8	13·6	2·84	50·0	2·3
Eastbourne ..	308,728	460	1·5	452	98·3	6	13·0	1·94	55·4	4·4
Hastings ..	332,478	328	1·0	292	89·0	2	6·1	0·60	53·2	4·5
Portsmouth* ..	929,210	4,053	4·4	2,638	65·1	29	7·2	3·12	63·4	3·7
Bournemouth*	364,525	438	1·2	377	86·1	1	2·3	0·27	64·8	3·0
Nottingham ..	1,334,458	2,629	2·0	1,708	65·0	36	13·7	2·70	94·8	4·2
Darlington ..	330,163	1,021	3·1	959	94·0	20	19·6	6·06	98·6	17·2
Gateshead ..	632,728	2,418	3·8	1,463	60·5	41	17·0	6·48	105·8	37·0
South Shields ..	594,412	1,467	2·5	1,086	74·0	17	11·6	2·86	104·8	36·5
York	422,175	1,075	2·5	802	74·6	10	9·3	2·37	77·8	9·3
Barnsley ..	299,728	531	1·8	468	88·1	5	9·4	1·67	113·0	15·0
Halifax* ..	402,973	935	2·3	668	71·4	4	4·3	0·99	98·6	13·2
Leeds	2,307,488	9,085	3·9	8,125	89·4	118	13·0	5·11	103·4	12·0
Sheffield ..	2,527,902	5,880	2·3	5,167	87·9	67	11·4	2·65	94·4	12·1
Wakefield ..	268,011	746	2·8	643	86·2	4	5·4	1·49	97·0	14·0
Tynemouth ..	319,837	769	2·4	564	73·3	4	5·2	1·25	98·6	34·4
Stockport ..	626,329	2,037	3·3	1,403	68·9	25	12·3	3·99	91·0	5·5
Chester ..	205,963	534	2·6	514	96·3	2	3·7	0·97	81·4	12·0
Wolverhampton	521,795	1,340	2·6	1,188	88·7	25	18·7	4·79	87·4	7·9
Bootle	382,436	1,633	4·3	1,193	73·1	43	26·3	11·24	91·0	11·6
Burnley ..	522,621	1,541	2·9	765	49·6	24	15·6	4·59	115·4	5·6
Liverpool ..	4,014,697	13,815	3·4	11,283	81·7	271	19·6	6·75	105·0	12·1
Manchester* ..	2,918,041	14,605	5·0	8,798	60·2	192	13·1	6·58	95·6	7·9
Oldham ..	740,543	2,449	3·3	1,777	72·6	39	15·9	5·27	106·4	7·9
Rochdale ..	462,941	1,682	3·6	1,242	73·8	23	13·7	4·97	95·4	8·1
St. Helens ..	524,500	1,377	2·6	1,345	97·7	27	19·6	5·15	108·4	21·0
Warrington* ..	313,156	887	2·8	846	95·4	11	12·4	3·51	86·6	12·1
Blackburn* ..	518,332	759	1·5	626	82·5	8	10·5	1·54	102·8	3·9
Barrow ..	368,118	1,052	2·9	536	51·0	7	6·7	1·90	86·2	11·0
Bolton	909,095	2,516	2·8	1,313	52·2	23	9·1	2·53	92·4	9·0
Wigan	451,642	1,050	2·3	779	74·2	22	21·0	4·87	113·0	15·3
Cardiff	1,028,305	4,911	4·8	3,257	66·3	73	14·9	7·01	85·8	8·6

* Four years' data only.

TABLE 6(*b*).

URBAN DISTRICTS, 1919–23.

	Total population.	Total cases.	Attack rate per 1,000.	Cases to hospital.	Isolation rate per cent.	Total deaths.	Fatality rate per 1,000.	Death rate per 100,000.	Mean 1919–23. Infant mortality.	1921 percentage overcrowding.
Cumberland.										
Carlisle ..	266,306	444	1·7	276	62·2	5	11·3	1·88	93·2	19·0
Staffordshire.										
Newcastle-under-Lyme*	61,194	33	·5	28	84·8	—	—	—	89·2	11·7
Wednesbury	156,035	313	2·0	4	1·3	2	6·4	1·28	97·4	13·0
Wolstanton ..	146,199	422	2·9	382	90·5	11	26·1	7·52	83·2	9·3
Lancashire.										
Chadderton ..	146,628	574	3·9	190	33·1	9	15·7	6·14	101·0	6·0
Droylsden ..	69,644	268	3·8	57	21·3	1	3·7	1·44	87·2	8·6
Eccles ..	222,119	990	4·5	218	22·0	10	10·1	4·50	74·4	5·3
Horwich ..	78,899	173	2·2	145	83·8	2	11·6	2·53	71·2	5·3
Nelson ..	202,675	296	1·5	21	7·1	2	6·8	·99	78·2	2·7
Rawtenstall ..	145,383	159	1·1	9	5·7	2	12·6	1·38	75·8	8·8
Stretford ..	232,955	1,169	5·0	594	50·8	21	18·0	9·01	65·4	2·2
Waterloo-with-Seaforth	147,935	510	3·4	292	57·3	12	23·5	8·11	85·6	5·2
Chester.										
Crewe ..	233,650	685	2·9	617	90·1	13	18·98	5·56	76·8	4·5
Hyde ..	170,076	465	2·7	435	93·5	13	28·0	7·64	94·4	5·4
Macclesfield	164,889	410	2·5	271	66·1	7	17·1	4·25	97·4	5·0
Stalybridge ..	127,503	274	2·1	13	47·4	3	11·0	2·35	109·2	6·3
Bedford.										
Bedford ..	201,175	506	2·5	442	87·4	6	11·9	2·98	60·4	1·4
Surrey.										
Wimbledon ..	304,630	935	3·1	784	83·9	5	5·4	1·64	56·8	4·8
Nottingham.										
Arnold ..	59,387	61	1·0	2	32·8	—	—	—	82·6	3·1
Worksop ..	116,065	62	·5	49	79·0	2	32·2	1·72	82·0	6·8
Derby.										
Ilkeston ..	164,216	179	1·1	138	77·1	2	11·2	1·22	99·6	5·5
Leicester.										
Hinckley ..	69,662	31	·4	26	83·9	—	—	—	81·2	2·9
Gloucester.										
Cheltenham	242,766	396	1·6	346	87·4	4	10·1	1·65	69·0	2·9
Warwick.										
Sutton Coldfield.	114,515	237	2·1	112	47·3	—	—	—	54·8	3·1
Worcester.										
Oldbury ..	190,501	583	3·1	205	35·1	9	15·4	4·72	86·6	11·7
Stourbridge ..	90,078	146	1·6	90	61·6	1	6·8	1·11	64·8	7·8
Northants.										
Kettering ..	150,718	466	3·1	320	68·7	3	6·4	1·99	72·8	4·2
Peterborough	177,189	354	2·0	300	84·7	1	2·8	·56	68·2	2·6
Durham.										
Blaydon-on-Tyne.	170,414	538	3·2	460	85·5	10	18·6	5·87	109·4	38·1
Felling-on-Tyne.	130,772	475	3·6	475	100·0	7	14·7	5·35	94·4	38·9
Jarrow ..	178,100	599	3·4	558	93·2	16	26·7	8·98	104·4	42·3
W. Yorks.										
Batley ..	180,830	363	2·0	341	93·9	6	16·5	3·32	86·8	18·8
Rawmarsh ..	91,295	245	2·7	209	85·3	4	16·3	4·38	103·0	10·5
Bingley ..	96,063	131	1·4	103	78·6	4	30·5	4·16	68·8	8·8
Keighley ..	213,302	275	1·3	235	85·5	3	10·9	1·41	102·6	9·7
Lancashire.										
Accrington ..	223,095	477	2·1	36	7·5	5	10·5	2·24	92·6	3·4
Audenshaw ..	40,402	154	3·8	29	18·8	2	13·0	4·95	98·8	7·7

	Total population.	Total cases.	Attack rate per 1,000.	Cases to hospital.	Isolation rate per cent.	Total deaths.	Fatality rate per 1,000	Death rate per 100,000	Mean 1919–23. Infant mortality.	1921 percentage overcrowding.
Middlesex.										
Acton ..	307,863	1,366	4·4	940	68·8	4	2·9	1·30	66·2	10·7
Brentford ..	85,168	428	5·0	404	94·4	2	4·7	2·35	76·4	9·9
Chiswick ..	203,974	578	2·8	415	71·8	3	5·2	1·47	72·6	9·8
Ealing ..	338,775	1,666	4·9	1,132	67·9	13	7·8	3·84	57·2	3·8
Edmonton ..	334,039	1,764	5·3	1,686	95·6	22	12·5	6·59	65·4	11·2
Enfield ..	305,301	1,033	3·4	755	73·1	5	4·8	1·64	59·2	6·2
Finchley ..	233,580	666	2·9	432	64·9	4	6·0	1·71	53·6	4·8
Hornsey ..	438,533	1,451	3·3	955	65·8	12	8·3	2·74	53·4	3·6
Tottenham ..	739,544	3,445	4·7	1,500	43·5	23	6·7	3·11	63·6	10·0
Willesden ..	847,448	3,452	4·1	2,240	64·9	28	8·1	3·30	65·4	13·2
Wales.										
Pontypridd ..	235,500	965	4·1	225	23·3	9	9·3	3·80	97·8	6·9
Rhondda ..	820,570	3,894	4·7	1,936	49·7	81	21·0	9·87	98·4	7·6

Taking first the actual magnitudes. It will be seen that there has been an increase, but not a very large increase, of the proportion of cases isolated, which has risen from 64·7 per cent. in 1911–15 to 68·3 per cent. in 1919–23 (Table 4). There has been a decided decrease of both fatality and mortality and some decrease of attack rate. Taking associated variables included in the correlation study, infant mortality has decreased very much and the percentage of the population overcrowded has increased substantially.

Passing to the correlations (Table 5), these are, in general, perfectly concordant with what was found for the earlier periods; with only one exception, the changes are within the usual limits of expected variations of sampling. The exception is that the correlation between the isolation rate and the fatality rate, which for the two earlier periods was significantly negative, is now insignificantly positive. We cannot, on the 1919–23 experience, assert that the fatality rate is really lower when the isolation rate is higher.

Dr. P. McKinlay, a research worker in this Department, has criticised the *prima-facie* inference from these figures for reasons which deserve careful examination. He suggested that even in areas where the gross isolation rate was low there would be sufficient hospital accommodation for all cases which, on clinical grounds, needed skilled nursing and attention. Now if we could regard the severity of scarlet fever as a graded character, represented, let us say, by a graph the ordinates of which were the numbers of cases and the abscissæ the severity, we should presumably have a very lop-sided diagram with a maximum to the left (assuming that the grades of increasing severity were scaled from left to right) and a long tail to the right. But the tail, the severe cases, would be a small fraction of the total area, certainly much less than 10 per cent. of it.

If all the severe cases on this hypothesis were removed to hospital there would be very few authorities indeed which did not have far more than sufficient accommodation for them. In these circumstances, whether the proportion of isolated cases as a whole were 15, 50 or 100 per cent. would be irrelevant from the point of view of fatality, since all the bad cases would be in hospital everywhere. Of course it would not be expected, even on this hypothesis, that in practice no severe cases would be treated outside hospital. One would still have, for instance, the cases in families of wealthy people, but the proportion of these to all cases would be so small that the general conclusion might stand.

This criticism cannot be adequately tested on purely statistical data; *inter alia*, the actual numbers of deaths are so small that one would expect

a great deal of irrelevant fluctuation. In many instances the addition or subtraction of a single death makes a great difference (in 39 of the available districts there were not more than 5 deaths from scarlet fever in 1919–23). Such analysis as we have been able to make is, on the whole, unfavourable to the idea. Thus, although the case mortality of home-treated cases is somewhat higher (not significantly so) than that of all cases, 19·9 per 1,000 against 18·0 per 1,000, which would be a very important argument in favour of hospital treatment were it a proven fact that the hospital admissions included a large majority of the grave cases, it is found that over 40 per cent. of all deaths from scarlet fever (in the 91 areas available for the study) in 1911–15 occurred outside institutions. It is difficult to believe in the face of this that the vast majority of severe cases are really admitted to hospital whatever the proportion of admissions to total notifications. We have not, however, found it possible to devise any really unambiguous test. Thus it might be thought that if all serious cases were removed to hospital everywhere there should be no correlation between the percentage of deaths at home and the isolation rate. Actually the correlation is large and negative, — ·716. But there is a "spurious" element involved, the denominator of the isolation rate (total cases) must be correlated with the numerator of the deaths ratio (deaths at home) since the more cases of disease the more deaths. We cannot satisfactorily eliminate this. Again the fact that there is not any correlation between the case mortality of home cases and the isolation rate is as well explained by supposing that the method of treatment is indifferent as by supposing that the character of the cases left at home does not change with changes of admission rate.

An argument against the importance of selective admission on the basis of severity is that the prognosis must often be very obscure at the stage of the disease when the question of removal has to be decided. This, however, is a clinical question.

It is of some interest to note that the importance of another and more obvious factor, viz., overcrowding is not when measured by correlation so great as one would have expected. The index of overcrowding is, with one exception, positively correlated with the isolation rate, but the magnitude of the correlation is small. This may, of course, mean that the co-efficient of correlation is not a good measure, owing to some failure of linearity of the regressions, but it may also mean that high or low proportions of admissions are much more determined by the variations of general policy of the health and medical authorities from place to place than from particular circumstances of the individual cases.

In addition to the general analysis we have made a special study of the experience of the Metropolitan Boroughs in the periods 1901–5, 1906–10, 1911–15. In no case have we discovered any significant correlation pointing to an advantageous result of isolation. Indeed the correlation of the proportion isolated with the case mortality rate is uniformly positive. But when both the total number attacked and the percentage of population living more than two to a room are held constant, this correlation becomes insignificant, being less than twice its probable error. It is not necessary to reproduce the tables as, owing to the very large proportion of cases isolated and the consequent limitation of the possible range of variation of one factor, the meaning of the correlation is obscure.

If one now summarises the results of this rather laborious investigation one has the following position. The point to point comparisons made with Professor Pearson and Miss Elderton's study of the statistics of diphtheria give substantially concordant results; where there is a difference (e.g., in connection with fatality) the difference is not more but less favourable to isolation as a beneficial measure. The analysis of 1919–23 does not modify these conclusions. It is, of course, right to emphasise the necessary imperfections of the statistical method. Co-efficients of correlation may not be trustworthy owing to peculiarities of the distribution, e.g., when the distributions around the mean value are very asymmetrical,

and the data are much too scanty to permit of using any more elaborate analysis. Again, owing to the very low death rate of the disease, rates are subject to a very large error of the nature, for the present purpose, of an error of observation which may be expected to diminish the magnitudes of the various correlations. When all this is said, however, the fact remains that these statistical results are perfectly compatible with, and, so far as they are valid, confirmatory of the inferences common sense led us to draw from the tabulation of opinions recorded in the questionnaires. When, as on every point, there was always a very substantial minority of observers, in spite of a natural bias in favour of the administrative measures for which they were responsible, reporting that they could not testify to any advantage, it seemed probable that the measures were not, as routine, of great value. This is just where the statistical analysis leads. We conclude that it has not been proved that with the epidemiological type of scarlet fever seen in this country during the last 20 years, hospital isolation has had any effect, good or bad, upon prevalence or any substantial effect upon either mortality or fatality. This is not to say that if we had been dealing with scarlet fever of 60 years ago with a more than ten-fold mortality and fatality we should have reached the same conclusion. But we have to deal with things as they are and the practical inference seems to be that unless and until scarlet fever reverts to a malignant type the present municipal hospital accommodation might be used to better purpose. It seems only common sense to suppose that in nearly all acute diseases, in pneumonia, in acute bronchitis, even in influenza (each of which kills many more people than scarlet fever), skilful nursing in hospital gives the patient a better chance of life than casual attention in a tenement. The only special argument in favour of dealing with scarlet fever selectively in hospital is the possibility of limiting the spread of infection. On this point at least, even without the statistical analysis, we may be fairly confident that the argument breaks down.

APPENDIX B

The Bacteriology of Scarlet Fever

By A. Eastwood, M.D.

At the present day, interest in the aetiology of scarlatina centres to a large extent, though not exclusively, in the revival and further development of an old theory.

This theory attributed the disease to a streptococcal toxin. Gaining access to the tonsils, streptococci multiplied in that neighbourhood and produced a toxin, which, on entering the general circulation, caused the characteristic symptoms and rash. The toxin stimulated the body to manufacture an antitoxin, which persisted in the circulation after recovery and rendered the subject immune against a second attack. The antitoxin, however, was not antibacterial; the patient would still be susceptible to septic infections attributable to streptococci, though not to the streptococcal toxæmia which was characteristic of scarlatina.

After much controversy, during which this theory made little headway, more favour was given to the view that streptococci were only secondary associates with scarlatina and that the disease was due to some unknown bacterium or other virus, perhaps too small to be visible under the microscope.

Interest is still maintained in this question of some hypothetical filter-passing agent, or of an agent which may be ultra-microscopic in one phase of its existence. What the outcome will be it is impossible to say. The whole subject of "filter-passers" is at present in the melting-pot; it is engaging the attention of many investigators, and one may hope that, at a reasonably early date, methods will be devised for identifying members of this class of viruses with precision. Until this is done, one can neither affirm nor reject the suggestion that the cause of scarlatina belongs to this group. This proviso must be borne in mind when considering the recent renewal of interest in the streptococcal theory.

The new developments are largely attributable to the work of Drs. George and Gladys Dick. These investigators swabbed the throats of five volunteers with culture of a streptococcus isolated from a case of scarlet fever. One of the five developed this disease. As a control experiment, the culture was passed through a Berkefeld filter and the throats of five other volunteers were swabbed with the filtrate. No disturbance of any sort was produced; but, when the same volunteers were swabbed later with the unfiltered culture, one of them developed scarlatina. Later, however, the Dicks succeeded in producing symptoms of the disease in human beings by injecting filtrates of streptococcal cultures derived from scarlatinal sources. These experiments are taken as supporting the old view that scarlatina is caused by a streptococcal toxin.

Now as to the antitoxin. Prior to the work of the Dicks, Schultz and Charlton had found that the serum of scarlatinal convalescents, when injected into the skin of patients with a well marked rash, produced blanching at the site of inoculation. The serum from some healthy individuals also caused blanching of the rash, but the serum from cases in an early stage of the disease failed to do so. These observations suggest that the toxin produces an antitoxin and that the antitoxin confers immunity, whereas susceptibility is correlated with absence of circulating antitoxin. This view has received strong support in the results obtained by the cutaneous test which was devised by the Dicks and has now been employed by many observers on a large scale. The "Dick test," as is well known, resembles the Schick test for diphtheria, streptococcal toxin being substituted for diphtheria toxin; in both cases a positive reaction is taken to mean susceptibility, owing to absence of antitoxin in the

circulation, whilst a negative reaction means immunity, due to an adequate supply of this protective substance.

Thus the old streptococcal theory, both as regards the toxin and the antitoxin, has now been supported and expanded on a wide basis of clinical observation.

What, then, is the present position concerning (1) the characters of these streptococci which are alleged to cause scarlatina, (2) the significance of their toxin, and (3) the efficacy of their antitoxin ?

(1) Many efforts have been made to show that, in serological characters, scarlatinal streptococci are identical amongst themselves and differ from all other streptococci. Unfortunately, the streptococcal species is too heterogeneous, possibly too unstable, to permit this easy line of demarcation. Strains from scarlatina are not all serologically identical ; and strains from other sources are sometimes identical with scarlatinal strains. Can this confusion be cleared up ? That is one of the unfinished problems upon which investigators are now engaged. It may, ultimately, be cleared up in one of two ways, either by showing (*a*) that there is a broad, and usually valid, distinction between scarlatinal and non-scarlatinal types and that any apparent exceptions are either attributable to the instability of the coccus or are from unsuspected scarlatinal contacts, or by showing (*b*) that the exceptions are too numerous to be explained away and that the attempted distinction must, therefore, fall to the ground, possibly to be replaced by some better form of classification.

(2) It is a highly interesting observation that in the filtrate from certain cultures of streptococci there is a substance which is antigenic ; it produces an irritant action on the human skin unless it is neutralised either by its specially prepared antibody or by some presumably equivalent substance circulating in the blood of the person subjected to the test. But, when clinicians call this substance in the filtrate a " toxin " and regard the Dick test as something on all fours with the Schick test, they are in danger of forgetting a fact which is familiar to laboratory workers. Diphtheria toxin is a very powerful poison, and is a very definite substance. It has not been found possible to show that the streptococcal " toxin " really is toxic, since it is not poisonous to laboratory animals. Moreover, workers on " toxins " of streptococci obtained from cases of scarlet fever have found that these " toxins " are not all alike, a circumstance which presents a difference from the true toxin of diphtheria. It has also been found that " toxins " from some streptococci not associated with scarlet fever are identical with some scarlatinal " toxins." Here, again, are problems which cannot be cleared up without further investigation, one of the difficulties being that laboratory animals are not suitable for deciding these questions by the experimental method. It must be remembered, therefore, that the scientific foundations for the Dick test are much less well established than those of the cutaneous test for susceptibility to diphtheria. But fresh work on streptococcal toxins is in progress and its outcome may make the position clearer.

(3) As to the properties of immune sera, it is admitted that they contain antibodies which act specifically towards the " toxins " employed in their preparation. The question of their therapeutic value is a matter for clinical observation and does not come within the scope of this chapter.

APPENDIX C

Interim Report on the Ministry's Enquiry into the Bacteriology of Scarlet Fever

By F. Griffith, M.B.

The purpose of the bacteriological work is to determine the relationship of hæmolytic streptococci to scarlet fever. The frequent occurrence of hæmolytic streptococci in the throats of scarlet fever patients is well known, but it has not been established that distinctive serological characters are associated with streptococci from scarlatinal sources. There would be a strong case in favour of the causal relationship of these bacteria to scarlet fever if it could be shown that they were sharply differentiated from streptococci of non-scarlatinal origin.

The bacteriological enquiry has been undertaken in three different localities, viz.: in Manchester, Liverpool, and at the Ministry's Laboratory, London. The work is not yet completed, but full laboratory details, so far as they are at present available, have been published in two articles, respectively, by Dr. G. R. James and the author, in the "Journal of Hygiene," 1926, xxv, 385 and 415. This interim report, therefore, is confined to a general statement of the results obtained from the material investigated at the Ministry's Laboratory during the period from January, 1925, to July, 1926. I am indebted to Prof. W. W. C. Topley, Dr. G. R. James, Dr. J. Shrewsbury, Dr. L. Colebrook, and Dr. R. A. O'Brien for many of the strains of streptococci used in this investigation.

Scope of the Investigation.

The main line of work has been the collection of strains of hæmolytic streptococci from scarlatinal and non-scarlatinal sources, and the comparison of their cultural and serological characters. It was decided to concentrate attention in the first place on the reactions of agglutination and agglutinin absorption, leaving the questions of protective substances and antitoxins for future study.

The usual methods of demonstrating serological types in a bacterial group were employed. A number of strains were taken haphazard and used to prepare agglutinating sera in rabbits. The intention was to test these sera against a series of strains and then to utilise those strains with which the sera did not react for the preparation of a further series of sera. It has been found that the production of satisfactory sera is a lengthy process, and not much progress has been made with the second series.

The first selection of strains was, however, fortunate, and appears to include the predominating types. The chief obstacle to progress in analysing serologically the streptococcus group has been the difficulty of obtaining sufficiently stable suspensions. As a result of this, direct agglutination tests by the ordinary method in the waterbath at 56° C. have so far, in my experience, been quite unreliable, and, in order to determine the type, it has been necessary to resort to the test of absorption of agglutinin. For this test every culture has to be grown in broth, from which the bacterial mass is recovered by centrifuging.

Cultural Characters.

Types of colonies.—Three chief varieties of colonies were found among both scarlet and non-scarlet strains.

(1) Flat or slightly convex disc, rough surface, coherent, picks up en masse on the needle on which it curls up in the form of a saucer; the colony undergoes various changes as the medium dries, e.g. the edges become crinkled and leave the medium; finally the colony looks like a dried leaf.

(2) Colony with raised rounded or conical central portion, and more flattened translucent margin; soft porridgy consistency.

(3) Flat translucent colony occasionally smooth on surface but more often contoured with a small whitish area in the centre; not so porridgy as (2). If the plate is left on the bench at room temperature the outlying colonies become shiny and watery, first at their margins, and finally a perfect dome-shaped watery colony is formed resembling a Type III pneumococcus except for the presence of whitish striæ in the centre. Occasionally the watery colony is found on the plate after a night's incubation, especially if the plate has been sown with septicæmic blood of a mouse.

The first (rough) type is most common on plates from throat swabs; the second occurs with moderate frequency. The second and third types are perhaps more frequent after passage of the culture through animals.

All three types of colonies may be found on plates from a single strain. Some of the rough strains have never produced anything but rough colonies, while others, especially those passed through animals, may yield any of the other two types. Some strains which have been repeatedly passed through mice have remained in the contoured colony condition (third variety), viz. Dochez, U.S. 55/4, S.F. 73/4 and 155/1 (the latter two strains from Manchester).

Sugar Reactions.—17 scarlet strains and 6 septicæmia strains were tested. All produced acid with mannose, lævulose, dextrin, maltose, glucose, saccharose, lactose, salicin, galactose, milk; slight acidity with xylose and arabinose; no change with erythrite, isodulcite, adonite, inosite, amygdalin, sorbite, dulcite, mannite, raffinose, inulin. In addition, one strain from cerebro-spinal fluid failed to ferment salicin, one strain from septicæmia fermented mannite.

Viability.—It is generally agreed that in culture hæmolytic streptococci are very long lived. I have made successful subcultures from blood broth tubes which had been sown eight months and had become completely dried up.

The following experiment was made to test the viability of the hæmolytic streptococcus when exposed to light and air. Strips of muslin were dipped in broth culture (plain broth and serum broth) and were suspended in a glass jar which was covered with a single layer of gauze. The culture used was the Dochez scarlet fever strain. The same culture was also sprayed from an atomiser over a layer of carpet sweepings in a large Petri dish. The preparations were made on July 29th, 1925, and were kept in a corner of the laboratory in a subdued light.

On August 11th, 13 days later, cultures were made. Both strips of muslin yielded confluent colonies while sparse colonies were obtained from the sweepings.

On September 20th a second test was made. The strip of muslin soaked in serum broth yielded a few discrete hæmolytic colonies. No growth was obtained from the plain broth strip and the sweepings.

On September 24th a third test showed that an occasional streptococcus was still viable on the muslin dipped in plain broth. On this occasion the serum broth strip, as well as the sweepings, failed to yield living hæmolytic streptococci.

These results confirm the experience of others that hæmolytic streptococci retain their viability for long periods when dried together with a medium containing albumin, and that they are much less resistant when exposed to the air in the form of fine droplets of culture.

Virulence.—All the three types of colonies which have been described may be virulent for mice. As regards grades of virulence, at present one can only say that the most consistently killing strains generally yield some colonies of the watery type (3). The rough (1) variety often produces a chronic disease; e.g. a mouse inoculated subcutaneously with a rough culture died 28 days later; cocci were not found in the blood, but were

numerous in the spleen, and a culture from the latter yielded rough colonies with a few watery.

The Dochez culture is virulent and produces type (3) colonies and Zingher's U.S. 55/4 acts similarly. U.S. 45/2 is not virulent, and produces rough colonies only.

Serological Tests.

Preparation of agglutinating sera.—Rabbits have been injected with five series (weekly) of killed culture (deposit of 50 c.c. from broth being the largest dose). Immunisation has been continued with living culture, the first dose 2 c.c. of broth culture being given subcutaneously: subsequent doses increased to 4 c.c. intravenously. One rabbit died in one day after the first subcutaneous dose (S.F. 159/2) of streptococcal septicæmia; a rabbit which had resisted 4 c.c. of culture (S.F. 22) died after 8 c.c.; some of the surviving rabbits had certainly become immunised; e.g., when they were found to tolerate an intravenous injection of 3 c.c. of living culture, control rabbits were inoculated with 0·5 c.c. of three of the strains and all succumbed to septicæmia.

The titres of the sera so far, using for the test suspensions which had been heated to 56° for one hour and had remained perfectly stable after standing overnight, varied from 1 in 200 to 1 in 6,400.

Agglutination Tests.—Direct agglutination tests have not been found to give reliable indications of type owing to the variable stability of streptococcal suspensions. Clumping at 56° C. with stable suspensions is not very rapid; it may take 2 or 3 hours before visible clumps are formed and the reaction is not completed until after 6 or 8 hours.

The clumps from good suspensions are generally fluffy in character and deposit well, but the deposited cocci are readily resuspended on shaking. Granular suspensions give firmer clumps which are less easily shaken up.

Agglutinin absorption tests.—The orientation experiments with nine agglutinating sera resulted in the selection of three chief type sera, that is to say, the strains from which these sera were prepared were shown to have several homologues in the collection under investigation. The remaining strains from which sera were made, including the Dochez strain, appear to be individual types and up to the present no homologues have been discovered.

The three chief type strains, all of which were from cases of scarlet fever, were obtained as follows, Type 1 (S.F. 130) from Prof. Topley, Manchester, Type 2 (S.F. 22) from Dr. R. A. O'Brien and Type 3 (U.S. 55/4) from Dr. Zingher, New York.

These types appear to be quite independent so far as absorption of agglutinin is concerned, as also on direct agglutination tests except in the case of U.S. 55/4, Type 3, and S.F. 130, Type 1. The Type 3 serum does not agglutinate the Type 1 strain, but the Type 1 serum produces fine granular agglutination with the Type 3 strain. This latter strain forms with its own serum fluffy clumps, and as the suspension alone is liable to become finely granular it would be unsafe to attribute much significance to the above interaction as evidence of inter-relationship.

The same strains from the series under investigation have, with a few exceptions, been tested against all three type sera.

Method of absorption.—As all three sera were approximately of equal titre a uniform method has been adopted. A broth culture of 100 c.c. was concentrated to 1·25 c.c. and to this was added 0·25 c.c. of a dilution of 1 in 16 of the serum to be tested. After standing overnight at room temperature, the mixture was centrifuged, and the clear serum dilution was titrated in parallel with the control untreated serum, testing dilutions from approximately 1 in 100 to 1 in 1,600. In the case of a positive absorption there was no agglutination, or at the most a trace in each of the first two tubes of the titration.

The following table shows in the case of each of the three sera the number of strains out of the total tested which have given a positive absorption result. Many of these strains have been tested two or three times and have given the same result, but in a few cases a strain originally absorbing has on repetition of the test failed to absorb. In view of this fact, for which at present an adequate explanation is not forthcoming, only positive results of absorption tests can be considered satisfactory.

Table of Absorption Results with 3 sera.

Source of Strain.	Tested *v.* Type 1		Tested *v.* Type 2		Tested *v.* Type 3	
	Total tested	Positive.	Total tested	Positive.	Total tested	Positive.
Scarlatinal	81	*14	79	14	75	11
Puerperal	46	4	45	0	45	1

* Two strains of Type 1 absorbed also Type 3 serum.

Discussion of Results.

1. It is clear that there is no single serological type of streptococcus present exclusively in the throats of scarlet fever patients. The existence of such would have been evidence in favour of the causative role of streptococci on scarlet fever.

2. On the contrary, the streptococci from cases of scarlet fever belong to a number of serological types. Three predominant types have been separated and representatives of two of these have been found also in cases other than scarlet fever. The distribution is as follows: out of 81 cases of scarlet fever, hæmolytic streptococci belonging to one or other of the three types have been obtained from 39, while 46 cases of puerperal septicæmia have yielded only 5 strains which could be typed.

3. A large proportion of the streptococci from scarlet fever and a still higher proportion of the strains from non-scarlatinal sources cannot at present be classified. The possibilities are that this unclassified group (1) may contain one or more dominant types other than the three already separated, (2) may consist of numerous individual strains like the Group IV pneumococcus, or (3) may contain strains which originally belonged to one or other of the three types but which, owing perhaps to the unfavourable influence of subcultivation, have lost their full absorptive capacities. This last contingency cannot be excluded, since it has in fact been found that a few strains which at first gave a positive absorption have, on being retested, given a completely negative result.

4. The occurrence of the same serological type amongst strains from scarlatinal as well as non-scarlatinal sources is not conclusive evidence against the hæmolytic streptococcus being the causal organism in scarlet fever. In the first place, a toxic strain might produce in one person scarlet fever, and in another septicæmia or puerperal fever. In addition, it is difficult to exclude a possible contact with a case of scarlet fever when the streptococcus is obtained from a throat or from a patient with puerperal fever. Out of 9 typed strains originating from non-scarlatinal sources, 4 were from throat swabs and 5 were from puerperal fever.

5. The distribution of the types is irregular, since out of a small series of 16 cultures from recent cases at the South-Western Fever Hospital* no example of Type 1 was found. Only 6, however, remained unclassified, 4 being Type 2 and 6 Type 3. This may be compared with the distribution

* For the swabs I am indebted to Dr. F. Foord Caiger.

in Aberdeen. Dr. J. Smith,* working at the City Hospital Laboratory, examined 210 cases of scarlet fever and obtained hæmolytic streptococci of Type 1 in 118, and of Type 2 in 57, the type being unidentified in 35 cases. Dr. Smith has sent me his strains for comparison, and I have found that his two types were identical with two which I had defined, and to which I have, therefore, given the same numerical designations. He has made the interesting observation that in cases of scarlet fever occurring in several members of a family the type is almost invariably the same.

6. The results of the serological work lend support to the thesis that the streptococcus is the causal agent in scarlet fever and will be a definite aid in the investigation of outbreaks of this disease. Moreover, there is a strong probability that a culture from a throat swab taken at an early stage to determine the presence or absence of hæmolytic streptococci will give material assistance in the diagnosis of doubtful cases of scarlet fever

* Smith, J. The serological classification of hæmolytic streptococci obtained from cases of scarlet fever. "Journal of Hygiene," 1926, xxv, 165-175.

APPENDIX D.

Report on "The Treatment of Aural Suppuration Occurring During the Course of Scarlet Fever," by the late Mr. Neil Maclay, M.B., C.M., Oto-Rhinologist to City Hospital for Infectious Diseases, Newcastle-upon-Tyne.

Zymotic diseases play a very important rôle in the causation of aural sepsis, and of the diseases so named, scarlet fever is probably the most offensive. Otologists have always been impressed by the number of cases of chronic ear-suppuration, active as well as healed, which have given a history of onset in connection with scarlet fever, and no doubt it is this circumstance which led the Scottish Otological Society to recommend the appointment of aural specialists to Infectious Diseases Hospitals, in order that investigation might be furthered in the direction of preventive measures. During the past three years, I have had the opportunity of assisting in the treatment of aural suppuration occurring in scarlet fever cases admitted to the Newcastle-upon-Tyne Infectious Diseases Hospital.

Since I commenced this work at the Fever Hospital, by a strange coincidence, the type of scarlet fever has been very mild in character and the number of cases admitted to the hospital relatively small, so that my experience has been to some extent curtailed. Nevertheless I have seen a sufficient amount of material to justify the formation of some considered opinions.

Theoretically, infection may reach the middle-ear cleft by the blood stream, lymphatic channels and through the eustachian tube; practically the latter route is the only one which we need consider. The eustachian tube is lined throughout by a mucosa which is continuous with that which covers the surface of the naso-pharynx, and at the same time it is carpeted by ciliated epithelium which plays an important rôle in the protection of the middle ear against microbic infection. The protective function of the eustachian tube, a function which cannot be too strongly emphasised, may be reduced or abolished altogether by repeated attacks of inflammation of its mucosa. While the general state of the body may predispose to tubal catarrh, we have good reason for the belief that local sepsis, such as is commonly found in the nose, naso-pharynx, fauces and mouth, provides the exciting cause. The inflammatory changes following upon infection of the middle-ear, are in all respects similar to those which take place in connection with acute inflammation in any part of the body. The swollen intra-tympanic mucous membrane very soon arrests the drainage and ventilating functions of the eustachian tube and the inflammatory exudate following the direction of least resistance finds a way through the drum-head.

In slight infections this drainage may be enough to allow nature to reassert herself and bring about resolution. On the other hand if the microbic agent is of a virulent type and what is even more important, if its growth is fostered by some focus in the mouth, fauces or naso-pharynx, then the inflammation will continue in spite of anything which may be done to facilitate drainage from the infected middle-ear.

The micro-organisms pass from the epithelium to the mucous and sub-mucous layers and with an increasing round-cell infiltration we soon have established all the changes associated with the chronic inflammatory state, including disorganisation of the middle-ear contents, and more or less destruction of the tympanic membrane.

This brief survey of the pathology of suppurative otitis media in general, which in no respect differs from the condition found in the ear during the course of scarlet fever, reveals the indications for treatment, and I venture to think justifies the measures adopted in this hospital. The onset of middle-ear trouble is commonly stated to be during the second week of scarlet fever and the presence of discharge is often the first sign or symptom, particularly in young children. For this reason the timely incision of the inflamed and bulging drum-head, so strongly advised by the writers of books, appears to be impracticable for it would imply at least a daily examination of the ears, conducted by an expert observer.

Quite a number of cases are admitted with the ears already discharging, in a proportion of those cases the otitis is of old standing and one can see varying degrees of irreparable damage. In order to cope in some measure with those difficulties we have instituted a routine examination of all cases as soon as practicable after admission. This initial examination includes, in addition to a scrutiny of the ears, a careful survey of the nose post-natal space, mouth, fauces and pharynx, and the state of each area is noted upon a special case-sheet. If the meatal canal contains wax or epithelial débris, it is cleaned out, and if there is any external otitis, this is treated. The majority of ear canals in my experience call for attention and quite a large proportion show some form of subacute or chronic external otitis invading in some instances the outer wall of the attic.

In addition to the diffuse external otitis, I have frequently noticed a small, red and very tender area, commonly on the posterior wall somewhere on the inner third. I am inclined to think that this little focus may be responsible for those post-auricular abscesses which clear up after incision and which are not connected with the mastoid cell area, though they might readily be mistaken for a mastoid abscess. This condition of the canal is treated by topical applications of spirit and biniodide or iodine. In a like manner an attempt is made to cope with any sepsis in the mouth, fauces or naso-pharynx without resource to operation at this stage. In this way we endeavour to make the highways leading to the middle ear cleft as clean as possible. If an ear-drum is found at this stage red or bulging it is promptly incised after the toilet of the meatal canal has been attended to. At the same time any abnormality of the membrana tympana is noted, such as old perforation scars, retraction or catarrhal signs.

When once discharge from the ear has become established, treatment is directed with a view to the promotion of drainage as well as the removal of any focus of infection which might further contaminate the middle ear. Every effort is made to keep the meatal canal clear of epithelial débris which so frequently tends to cling to the membrana tympana and block up the perforation. For this reason hydrogen peroxide drops are never employed, because it is thought that they encourage the desquamation of epithelium. The canal of the ear is syringed out twice or three times a day with warm solution of sterile normal saline and soda bicarbonate, and after each wash-out the canal is carefully dried out right down to the drum-head. I am aware that certain people deprecate the use of ear lavage in acute suppuration, and hold the opinion that such treatment is likely to force the liquids into the middle-ear cavity. They confine their activities to mopping and the use of drops. It is difficult to understand the reason for this conclusion even on purely theoretical grounds, and it is most difficult to know what therapeutic effect can be hoped for in the middle ear by the introduction of drops into the meatus.

If the aural suppuration persists in the third and fourth week and shows little or no response to the cleansing treatment already mentioned, it invariably means that there is some focus of infection in the naso-pharynx. Reference to the case sheet will show, as a rule, that the condition of the faucial tonsils and adenoids were commented upon unfavourably at the initial examination. Under those circumstances the house-surgeon interviews the parents or relatives of the patient and seeks the necessary permission for operative treatment.

The operation for the complete removal of tonsils and adenoids is carried out without haste under chloroform and ether anæsthesia, and every effort is made to minimise hæmorrhage, bleeding points being ligatured where necessary in order to have the throat dry before the patient is removed from the operating table. So far no untoward post-operative results have been noted. As a general rule the ear discharge ceases and the perforation is healed in from seven to ten days after the tonsil and adenoid operation has been carried out. Subsequently, politzer inflation is performed in order to facilitate the ventilation of the tympanum and restore function.

APPENDIX E.

Note by MILES ARNOLD, M.D.,

on

Prolonged Infectivity in Scarlatina.

In discussing the weight of the evidence proving that one person has infected another, agreement as to the minimum incubation period is essential. I have assumed that the incubation period in scarlatina may sometimes be less than 2 days. My impression after examining the literature is that most observers would agree to this. It will be seen later that in most of the cases quoted the writers have assumed that declared infectious illness might with great probability be attributed to some contact within the previous 2, 3, or 4 days. If, therefore, such short incubation periods were not accepted most of the evidence here presented must be considered invalid. The evidence of short incubation periods seems to me personally to be overwhelming. It is, however, only fair to remember that there are writers with large experience who doubt whether the incubation period is ever so short; for example, J. H. McCollom and E. H. Place in the article on scarlatina in the 1915 edition of Osler and McCrae's System of Medicine say that they are convinced "that the limit is practically 4 to 20 days with an average of 10 to 14 days."

A porter of a virus may have acquired it and reacted at the time to the degree necessary for clinical recognition of the specific infection, or may have reacted abnormally, as in the case of scarlatina without a rash, or may not have reacted in any way clinically recognisable. Theoretically any such persons might give off sufficient virus to infect a susceptible person. Proof in the third type would be very difficult in the case of scarlatina, and I have not come across any clear evidence. With regard to the second type there is a widespread belief that a person who has had a sore throat may be a source of infection of fully developed scarlatina. In this connection there is an interesting observation by Dr. W. Butler (Ref. No. 20*a*). In obtaining histories in the investigation of notified cases he found that in the households invaded by scarlatina there had been sore throats within a month of the date of enquiry in 31·2 per cent., whereas in houses invaded by other notifiable diseases there had been sore throats in only 2·8 per cent. The assumption that the sore throats in the first group were due to the scarlatina virus has been attacked.

With regard to all cases there remain the questions of duration of infectivity and of the constancy of infectivity. There is evidence that certain porters of the virus of scarlatina give it off in infective doses from time to time but not constantly. Some evidence of such recrudescence will be found in the histories of cases of suspected prolonged infectivity.

Infectivity of Scarlatina.

It is generally agreed that presumably susceptible persons in contact with patients ill with scarlatina are less likely to become infected than in the cases of susceptible persons meeting with measles, chickenpox and certain other diseases. With the promise of more accurate knowledge as to real susceptibilities it may be possible later to make more precise estimates. The late Dr. J. Niven (Ref. No. 96) in 1901, and the present writer in 1911 (Ref. No. 1*a*), tried to estimate the infectivity of scarlatina and the rate of decrease in infectivity from the first week. The methods used have considerable possibilities of errors, but the two investigations done for different years and by rather different methods, give similar results. Briefly and broadly the results suggested that in uncontrolled domestic contact patients ill with scarlatina infect 30 per cent. of susceptible persons with whom they come into contact during the first week

of illness, about 20 per cent. during the second week, about 10 per cent. during the third week and round about 5 per cent. in the fourth. If a similar fall took place in the fifth week the ordinary return case rate might be expected to occur on the discharge of patients from hospital after four weeks.

The table of return cases given in Dr. F. M. Turner's Metropolitan Asylums Board Report on the years 1902, 1903 and 1904, shows very clearly that amongst patients who had averaged much over 6 weeks' stay in hospital an appreciable number apparently remained infective for a month after discharge from hospital.

Protracted Infectivity.

Before describing in detail cases strongly suggestive of infection by known persons, more general evidence such as that given by Dr. Butler (Ref. No. 20*a*) may be mentioned. He had been struck by the frequency with which scarlatina invaded a house a second time in a year or even longer after the occurrence of the first case. The greatest attention to the details of disinfection had been given. He tabulated the figures for Willesden for the years 1900 to 1907 inclusive: 2,882 houses had been invaded and the number of recurrent infections in these was ascertained. The incidence in those previously infected houses was compared with the figure of incidence which those houses would have shown if they had shared with all the houses in Willesden an equal distribution of scarlatina. The result is shown in the following table:—

TABLE SHOWING RECURRENT CASES (IN ITALICS) AND COMPARATIVE FIGURES IN INTERVAL GROUPINGS IN RELATION TO WHICH THE RESPECTIVE HOUSES WERE PRIMARILY INVADED DURING AN IDENTICAL PERIOD.

Year.	3 weeks to 3 months.		3 to 6 months.		6 to 12 months.		1 to 2 years.		2 to 3 years.		3 to 4 years.		4 to 5 years.	
1900 ..	*8*	0·7	*6*	0·9	*5*	1·8	—	—	—	—	—	—	—	—
1901 ..	*28*	1·9	*5*	2·5	*7*	5·0	*9*	6·0	—	—	—	—	—	—
1902 ..	*14*	1·3	*5*	1·7	*4*	3·4	*6*	8·0	*6*	4·9	—	—	—	—
1903 ..	*16*	1·4	*9*	1·8	*8*	3·6	*10*	6·8	*4*	8·0	*3*	4·8	—	—
1904 ..	*22*	0·5	*4*	0·7	*1*	1·4	*6*	4·4	*5*	4·1	*3*	4·9	*1*	3·0
1905 ..	*15*	0·9	*8*	1·1	*6*	2·2	*7*	3·4	*11*	5·5	*12*	5·1	*8*	6·0
1906 ..	*23*	2·2	*11*	2·7	*7*	5·9	*14*	7·1	*14*	5·5	*9*	8·9	*12*	8·2
1907 ..	*36*	2·0	*6*	2·5	*11*	5·0	*18*	10·8	*8*	6·5	*6*	5·1	*7*	8·3
	162	10·9	*54*	13·9	*49*	28·3	*70*	46·5	*48*	34·5	*33*	28·8	*28*	25·5
Mean	20·25	1·4	6·75	1·7	6·1	3·5	10·0	6·6	8·0	5·7	6·6	5·72	7·0	6·4

Dr. Butler pointed out that, as the interval between primary and secondary infection of a house lengthened, the difference between actual infection and the comparative figure decreased, otherwise it might have been argued that invaded houses have increased risks owing to the age distribution of their inmates which would account for the difference. He did not consider the data to be of sufficient magnitude to be considered more than suggestive.

H. P. Berry (Ref. No. 8) in an experience of 18 years as Medical Officer of Health of Grantham had only once met with a fresh case occurring in the same house after recovery of the patient and disinfection of the premises. In 1905–6 in an epidemic of 331 cases he found 19 cases which after apparently complete recovery and disinfection, gave rise to 28 others, and he suspected the same influence in other cases. Some of the patients

had been treated in hospital and some at home. Most of the cases appear to have been ordinary return or recovery cases, but the following more protracted ones may be mentioned.

A.P. taken ill November 28th, 1905, treated at home.

S.P. admitted to hospital March 2nd, 1906.

T.W. admitted to hospital February 6th, 1906, discharged April 7th.

L.W. admitted to hospital September 2nd, 1906.

B.O. taken ill November 25th, 1905, treated at home.

W.O. admitted to hospital October 29th, 1906.

Dr. Berry said that he had been at some pains to eliminate the possibility of other sources of infection. He concluded that persistency of infectivity varied in different epidemics, and considered that the infection might lie dormant "possibly in some of the nasal chambers until some suitable condition rendered it capable of transmission."

Dr. D. J. Thomas, of Acton, has sent notes of four instances in which second infections occurred from six to twelve months after the first; in three of these the family had moved to another house in the interval.

Apart from such cases as those just quoted, which are only noteworthy when they occur in large numbers as any one of them might be due to an unknown cause, there are some striking instances in which one person has been suspected, long after convalescence, of infecting others.

The following is an abstract of a paper by Dr. W. B. Young (Ref. No. 145), with some additional information obtained by correspondence with him:—

D.N., aged 7 years, was admitted to an Isolation Hospital on March 21st with scarlet fever; after a sharp attack he was discharged on June 2nd. A day or two later he had tonsillitis. He went to a nursing home, where his tonsils were enucleated and adenoids removed. He returned home apparently in good health on June 16th, and came into contact with his brother, B.N., aged 7.

B.N. began to be ill on June 18th and was removed to hospital on June 20th with scarlet fever. The disease was mild. He was discharged on July 23rd.

D.N. had remained at home till he was joined by his brother on July 23rd, and both went to the seaside on July 28th. Another brother, O.N., after returning from school, joined them on the 29th. The N. family stayed together with some friends, the F. family in a house in an isolated position on the seashore.

On August 9th O.N. and Q.F. both developed scarlet fever. No other source of infection could be traced. Later in this holiday N.F. and Mrs. N. developed scarlet fever. The dates of onset cannot now be ascertained. Mr. N. returned home on August 27th. He is said not to have been in contact with the patients after they were taken ill.

On September 17th D.N. and his father went to London to stay with friends. D. had then a slight cold. Mr. N. returned home on September 19th not feeling well. He had an illness which was suspected to be scarlet fever, and he subsequently desquamated on the hands. On September 20th information was received that two children at the house where D.N. was staying had developed scarlet fever. D.N., who appeared to be the only source of infection, came home and was sent to an Isolation Hospital. He was well except that he had a slight nasal catarrh and slight nasal obstruction.

Subsequently it was found that D.N. had visited about September 10th a house in another part of the town and played with a baby. The baby had an illness two or three days later diagnosed as severe German measles. There was profuse nasal discharge and later slight desquamation on the feet. A woman nursing the baby had a definite attack of scarlet fever shortly afterwards.

No further cases were traced to D.N. during the next few months.

Dr. E. W. Goodall (Ref. No. 20*a*), in a discussion at the Royal Society of Medicine, gave an account of a case of which the following is an abstract:—

R.C., aged 13, a boarder at a private school, was taken ill on December 14th. On December 17th he was sent home and scarlet fever was diagnosed the next day. He did not have a very severe attack.

On February 24th he went back to school. The next day his mother developed scarlet fever and was isolated. The boy's two sisters, who had associated with him at home, were sent away to another house.

On March 2nd, R.C. was sent home as two boys had developed scarlet fever four days after he had returned to school. The boy stayed at a house apart from his mother and apart from his sisters, but he met his sisters daily.

On March 22nd one of the sisters failed with scarlet fever and was sent to yet another house.

On April 20th a kitchen maid developed scarlet fever.

R.C. was kept away from school during the summer but was allowed to meet other children without any known ill effect. He went to school on September 24th. On September 29th a boy sleeping in the next bed developed scarlet fever and another boy was attacked a day or two later.

R.C. was sent home. On October 4th his nose was blocked up and later there was a good deal of coryza.

A throat specialist reported that though the pharyngeal mucous membrane was not quite normal there was nothing needing operation. Dr. Goodall stressed the apparent intermittency of infectivity in this case.

I have not come across other cases where the dates of a series of contacts and onsets were so clear, but there are many cases recorded which are strongly suggestive of infection persisting or recrudescing. The following are examples:—

Sir Arthur Newsholme. (Ref. No. 95*d*.) X.B., aged 6, onset September 10th, discharged from hospital October 23rd. Remained well till November 15th, when he seemed to have a cold. Sister, aged 4½, onset November 17th.

G.U., aged 5, onset August 1st, isolated at home till September 12th, when disinfection was carried out. Afterwards played with her sister. On October 1st went to Brighton, staying on the way at a house where there were 10 children. At Brighton, G.U. slept alone till October 10th. That night, as she appeared to have a cold, she slept with her mother and sister. The latter had scarlatina on October 12th.

Dr. R. M. Littler. (Ref. No. 78.) H.T., aged 6, developed a typical attack of scarlet fever and was sent to an Isolation Hospital. She remained there 9 weeks, having some nasal discharge. This entirely ceased, and there was no recurrence. On her discharge a baby aged 14 months was sent, to avoid any possibility of infection, to a home of a relative who had three children of her own. After three weeks, that is 12 weeks from the onset, there was a reunion of both families in the home of the patient on a Sunday. On the following Wednesday two of the cousins sickened with scarlet fever, and the third had a sore throat which was not followed by a rash. On the Friday the baby developed a typical rash, and a day or two later developed acute otitis media. There had been the usual disinfection. After careful inquiry no other source of infection could be ascertained.

F. J. Vincent Hall. (Ref. No. 54.) Three months after her attack was apparently cured a little girl was sent to her grandmother's in the country. While out for a walk a nursemaid, accompanied by the child and a little boy cousin, used her own pocket handkerchief to both the boy and girl. Both the boy and the nursemaid developed scarlet fever a few days afterwards and had it severely. There was at that time no other case in the district.

W. Habgood. (Ref. No. 52.) Habgood suggests that persons having recovered from scarlet fever may remain non-infective until they have nasal catarrh.

H.M., age 6. Date of attack April 28th. Discharged from hospital June 19th. Stayed with a relative until August 22nd, when she returned home. On September 16th her sister, age 7, developed scarlet fever. When visited, H.M. was seen to have a nasal discharge which had followed a cold in the head some days previously. There was no other known source of infection.

J.W.R., age 8 years. Date of attack July 22nd. Discharged from hospital September 7th. His sister, aged one year, began the scarlet fever on October 23rd. J.W.R. was found to have pus in both nostrils. There was no other known source of infection.

There is also evidence of a less direct kind where in some institution there has been a series of cases at intervals and suspicion has fallen on some person as being the source of infection, and cases have ceased to occur after the removal of the suspected person.

A. J. Laird. (Ref. No. 73.) From the middle of December, 1921, to May, 1922, a series of 32 cases of scarlet fever occurred in a General Hospital. 18 were in one ward, 4 in each of two other wards, and one in each of two other wards, and one in the out-patients department. Three cases directly associated with the hospital sickened in their own homes. The distribution in time was as follows:—

5 cases in the second half of December.
4 ,, January.
5 ,, February.
5 ,, March.
4 ,, April.
8 ,, May.

22 of these were patients, 6 were nurses, one a ward maid, 3 sickened in their own homes. In addition to these definite cases there were numerous sore throats.

On the 30th April a ward maid who was working in the ward where there had been 18 cases visited a remote part of the Borough in which there were no known cases of scarlet fever. She played with and kissed a boy age 5. He sickened with scarlet fever on the 3rd May.

On the 30th April a boy who had been in the hospital since the 16th, sickened with scarlet fever. It was found that the ward maid in question had visited this ward in which she was not employed and had spoken to the boy.

The ward maid was discharged on the 11th May, meeting on that day her successor who sickened on the 17th. It was found on inquiry that the ward maid had suffered from sore throat since childhood and had had attacks in December and January. She had chronic enlargement of the tonsils and deflected nasal septum. She had not had scarlet fever, although all her brothers and sisters had had it in 1910. After she left the hospital no further cases occurred up to the time of the report in September.

There have been other instances in which the presence of scarlatina carriers in institutions was suspected, but after some correspondence I have not found another case sufficiently definite to be worthy of special quotation.

Reference should be made to the views of *Dr. Dunstan Brewer*, of Swindon. He holds that the infective period is usually very short, but that in a few cases patients remain infective for many months and even for years, and that in non-epidemic periods they are the main source of infection. He believes that during a period of low incidence of scarlatina in Swindon he arrived at the stage at which every new case in Swindon could either be attributed to infection from outside, or to infection from one of the few known carriers in the town. He tried to prove his thesis by getting carriers away from the town or by specially supervising them. Unfortunately Dr. Brewer has not kept very complete notes of the evidence he collected in the early days of his belief in such carriers, and I have not been able to get a tabular statement which would go much further than the general statement that for over a year when there was very little scarlatina occurring in Swindon he was able to attribute nearly all cases to either one of two known carriers or to outside infection.

An interesting note may be quoted from *Richardson*, writing in the "Asclepiad" in 1862. Richardson mentioned the case as evidence of infection from fomites. Probably most people now would suspect an overlooked attack of scarlatina in the parents with subsequent prolonged infectivity.

> A man and wife lived with their four children in one of a few cottages near a village in Essex. "The poison of scarlet fever entered this poor man's door and at once struck down one of his flock." The other children were removed to the care of a grandparent living some few miles away. Some weeks later one child was allowed to return home. "Within 24 hours he was seized with the disease and died with equal rapidity to the first." "We were doubly cautious in respect of the return of the other children. Every inch of wall in the cottage was cleansed and limewashed; every article of clothing and linen was washed or destroyed. Floors were thoroughly scrubbed and as much as four months was allowed to elapse before the children were brought home. Then one day the boy, aged 9 years, was allowed to return. He reached the cottage early in the morning. He seemed dull the next day, and at midnight in the succeeding 12 hours I was sent for to find him also a subject of scarlet fever."
>
> The child died. Richardson left the neighbourhood soon after and did not know the subsequent history. He believed that the cottage thatch, which came down quite near to the beds, was the source of infection.

After reconsidering the evidence on this subject I have found no reason to change the paragraph with which I ended the paper already referred to.*

"To sum up, one may say that scarlatina is a moderately infectious disease for 2 weeks after the onset, but that the majority of the cases cease to be infectious some time during the second fortnight, so that at the end of the fourth week only a small percentage remains so. Out of this small percentage some, including some mild cases, probably remain infectious for several months, though they are not recognisable by any known method; it is possible a still smaller number retain the power of infecting for a much longer period, perhaps even so long as a year."

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* M. Arnold. The period of infectivity in scarlet fever. *Pub. Health*, 1910–11, XXIV, 414.

APPENDIX F.

Note on information given in Section A, Questions 3 and 5 (Questionaire to M.O.H.), regarding population figures.

(*a*) With respect to the years 1911 and 1921, and excluding those combined districts where the census figures are not given separately for each component district, it appears that in England the population has increased in 492 towns and districts, decreased in 211, and remained nearly stationary in 123; in Wales, it has increased in 55, decreased in 21, and remained stationary in 12, so that in proportion the state of things in the two countries is almost similar. The English Counties in which a large majority of towns and districts show an increased population are Cheshire, Derby, Durham, Essex, Kent, Lancs, Middlesex, Northumberland, Notts, Staffs, Surrey, Warwickshire and Yorks; in Wales, Glamorgan and Monmouthshire are the counties in which the increase of population is most marked. Population has declined chiefly in the counties of Cornwall, Gloucestershire, Lincoln, Norfolk and Somerset, Cardigan and Montgomery, but there are also 27 districts in Lancashire and 25 in Yorkshire where the population has diminished. The figures supplied in this enquiry, therefore, tend to corroborate the conclusion of more special investigations that on the whole the population has risen in the industrial areas and fallen in the rural or agricultural districts.

(*b*) From the replies to Question 5 it would appear that the majority of reporters have not noticed any change in the age-distribution of the population during recent years. The answers of the remainder may be summarised in the following table where the words "more" and "fewer" are used in a proportionate sense.

—	England.						Wales.					
—	Urban.			Rural.			Urban.			Rural.		
Nature of change.	More adults.	Fewer children.	More children.	More adults.	Fewer children.	More children.	More adults.	Fewer children.	More children.	More adults.	Fewer children.	More children.
No. of districts.	53	38	14	13	6	4	3	4	3	3	1	1

It may be remarked that cities and large towns form a high proportion of the districts in which a change in the age-distribution among the general population has been noticed. And the change which has occurred in most of these districts is broadly a decline in the proportion of persons coming under the earlier age-groups, and an increase in the proportion of those who occupy the later age-groups. This is well shown in the following comprehensive table sent in from Bristol by Dr. Davies.

Bristol: Percentage at Age-Periods on Total Population.

Ages.	1881	1891	1901	1911	1921
Under 5	13·06	11·59	11·16	9·91	8·32
5–10	11·29	11·36	10·94	10·10	8·74
10–15	10·91	11·56	10·70	9·95	9·58
15–20	10·37	10·76	10·42	9·91	9·48
20–25	9·25	9·63	9·90	8·89	8·49
25–30	8·22	8·25	8·68	8·28	8·20
30–35	6·80	6·70	7·43	7·90	7·47
35–40	6·08	6·04	6·43	7·17	7·33
40–45	5·36	5·35	5·28	6·23	6·92
45–50	4·51	4·62	4·67	5·32	6·38
50–55	3·89	3·90	3·93	4·33	5·32
55–60	2·96	2·97	3·13	3·47	4·31
60–65	2·79	2·55	2·59	2·87	3·28
65–70	1·91	1·83	1·91	2·38	2·60
70–75	1·30	1·39	1·36	1·60	1·78
75–80	0·73	0·83	0·80	0·92	1·11
80–85	0·34	0·35	0·41	0·47	0·52
85–90	0·10	0·12	0·12	0·15	0·19
90–95	0·0322	0·0297	0·0303	0·0411	0·0417
95–100	0·0073	0·0036	0·0033	0·0047	0·0063
100–	0·0007	0·0013	—	0·0005	0·0010
At all ages.	100	100	100	100	100

Moreover—and this is important from the point of view of the present enquiry—the proportion of children of school-going age (i.e. scarlet fever susceptibles) has been steadily declining in many towns; a few examples may be quoted from the answers of reporters:—

Linton R.D. In 1881, of 12,427 persons 5,096 were under 15 = 39·3 %.
„ 1921 „ 9,926 „ 2,433 „ „ „ = 24·5 %.

Fleetwood. In 1911 children of school age = 17 % of population.
„ 1921 „ „ „ „ = 15 % „ „

Crewe. In 1911 children under 15 = 32·8% of population.
„ 1921 „ „ = 26·7 % „ „

Derby. In 1911 „ 0–10 = 20·6 % 35 and over = 35 %.
„ 1921 „ „ = 17·6 % „ „ = 40 %.

Ilkeston. In 1911 „ between 5–9 = 12·2 % of total population.
„ 1921 „ „ „ = 10·7 % „ „ „
„ 1911 „ „ 10–14 = 10·8 % „ „ „
„ 1921 „ „ „ = 11·0 % „ „ „

Liverpool.

Age.	1911	1921	Decrease.
Under 3 years	18,626	13,636	4,990
,, 4 ,,	17,991	13,251	4,740
,, 5 ,,	18,039	14,974	3,065
,, 6 ,,	17,429	15,675	1,754

Sunderland. In children between 5–15 there is a decrease of 5·0 per cent. since 1911.

Hartlepool. Marked decrease in 0–10 group—others increased.

Birmingham. Proportion of children under 4 has fallen from 110 to 92 per 1,000 since 1911.
Proportion of children between 5–9 has fallen from 105 to 96 per 1,000 since 1911.
Adult population proportionately increased.

Edmonton. In 1914 school children (5–14) formed 19·7 % of population.
,, 1923 ,, ,, ,, ,, 15·7 % ,, ,,

Hendon.

Year.	Total population.	Children under 15.	Percentage of population.
1901	22,450	7,475	33·0
1911	38,806	11,308	29·0
1921	56,013	13,587	24·0

Eastbourne.
Under 5 proportion is 2·0 % less.
Between 5 and 14 ,, ,, 1·0 % ,,
,, 15 and 24 ,, ,, 2·5 % ,,
,, 25 and 64 ,, ,, 3·5 % more.
Over 65 ,, ,, 2·2 % ,,

Southwark.

Ages.	Census 1901.	Census 1921.
5–10	21,905	18,904
10–15	20,506	18,768

Bristol.

Ages.	1881	1891	1901	1911	1921
Under 5	13·06	11·59	11·16	9·91	8·32
5–10	11·29	11·36	10·94	10·10	8·74

Tottenham.

Age.	1911		1921	
	Males.	Females.	Males.	Females.
Under 5	13·1	12·2	9·9	8·5
5 and under 10	11·8	10·9	11·0	9·9

Manchester.

Year.	Population.	Ages 0–4	Ages 5–9
1901	644,800	11·5	10·3
1911	714,385	10·9	10·0
1921	730,307	8·6	9·2

Stockport.

Age.	1911	1921
0–5	10·25	7·6
5–10	9·6	8·4

APPENDIX G

Incidence of Scarlet Fever in the County Administrative Areas, 1918—1924.

County.	1918.		1919.		1920.		1921.		1922.		1923.		1924.	
	No. of cases.	Rate per 1,000.	No. of cases.	Rate per 1,000.	No. of cases.	Rate per 1,000.	No. of cases.	Rate per 1,000.	No of cases.	Rate per 1,000.	No. of cases.	Rate per 1,000.	No. of cases.	Rate per 1,000.
ENGLAND.	44,803	1·44	74,431	2·23	107,919	3·10	126,819	3·61	100,804	2·85	80,368	2·26	79,542	2·18
Bedfordshire	258	1·36	357	1·81	394	1·92	419	2·04	317	1·52	209	0·99	134	0·63
Berkshire	222	1·29	177	0·97	325	1·72	651	2·23	790	3·94	421	2·10	331	1·62
Buckinghamshire ..	138	0·66	203	0·93	353	1·56	626	2·70	546	2·33	467	1·98	361	1·48
Cambridgeshire ..	85	0·74	217	1·72	220	1·68	173	1·34	215	1·66	141	1·09	262	1·99
Cheshire	754	1·37	1,383	2·30	1,680	2·69	3,272	3·17	2,050	3·24	1,668	2·62	2,013	3·08
Cornwall	271	0·96	432	1·41	241	0·76	248	0·79	312	0·99	297	0·94	222	0·69
Cumberland	164	0·83	144	0·70	272	1·27	422	1·56	306	1·40	445	2·03	438	1·95
Derbyshire	724	1·39	875	1·60	1,182	2·07	1,715	2·38	1,196	2·01	1,137	1·90	1,448	2·34
Devonshire	276	0·74	444	1·13	484	1·19	949	1·40	481	1·15	621	1·47	496	1·14
Dorsetshire	160	0·81	247	1·19	212	0·98	319	1·47	276	1·27	220	1·00	210	0·93
Durham	2,282	2·75	4,071	4·57	5,434	5·87	4,958	3·31	1,841	1·90	3,138	3·22	4,084	4·06
Isle of Ely	63	0·99	146	2·14	221	3·11	312	4·24	121	1·62	25	0·33	70	0·91
Essex	828	1·07	1,539	1·81	2,546	2·88	7,881	5·42	2,378	2·59	1,365	1·47	1,529	1·59
Gloucestershire ..	245	0·84	337	1·09	537	1·67	2,096	2·75	603	1·83	789	2·38	477	1·40
Herefordshire ..	71	0·69	89	0·84	196	1·77	171	1·53	156	1·39	138	1·22	103	0·89
Hertfordshire	263	0·88	657	2·10	863	2·65	954	2·87	814	2·43	486	1·44	401	1·15
Huntingdonshire ..	72	1·42	63	1·22	87	1·62	98	1·79	90	1·64	41	0·74	42	0·74

Kent	1,166	1·28	1,851	1·88	2,747	2·69	3,705	3·41	2,605	2·44	1,668	1·55	1,529	1·39
Lancashire	1,921	1·25	4,066	2,45	4,774	2·76	19,915	4·01	5,640	3·19	4,328	2·44	3,400	1·88
Leicestershire	318	1·40	404	1·61	464	1·78	1,204	2·41	303	1·14	218	0·81	246	0·89
Lincoln—Holland ..	54	0·70	67	0·82	141	1·66	108	1·25	124	1·44	82	0·95	140	1·58
,, Kesteven ..	97	0·92	92	0·84	189	1·67	171	1·63	80	0·75	84	0·78	66	0·61
,, Lindsey ..	259	1·14	288	1·21	432	1·75	464	1·15	234	0·92	350	1·36	408	1·54
Middlesex	1,321	1·15	3,820	3·11	4,550	3·56	8,125	6·46	5,133	4·05	2,378	1·87	2,321	1·77
Norfolk..	205	0·73	896	3·02	625	2·03	655	1·33	462	1·46	541	1·70	551	1·68
Northamptonshire ..	107	0·56	126	0·61	166	0·77	415	1·36	368	1·72	966	4·51	1,026	4·69
Northumberland ..	563	1·59	858	2·27	1,957	4·98	3,091	4·18	1,138	2·83	1,251	3·08	1,151	2·76
Nottinghamshire ..	415	1·22	725	1·98	846	2·22	1,057	1·63	518	1·34	618	1·59	839	2·11
Oxfordshire	77	0·65	79	0·63	99	0·76	475	2·53	402	3·04	377	2·83	227	1·66
Peterborough	139	3·03	77	1·77	91	2·01	93	1·98	74	1·56	91	1·90	41	0·83
Rutland	19	1·08	19	1·13	17	0·97	36	1·98	18	0·98	23	1·25	27	1·44
Shropshire	207	0·96	257	1·11	281	1·17	525	2·16	502	2·06	420	1·71	466	1·86
Somersetshire	405	1·18	405	1·13	478	1·28	688	1·47	684	1·76	941	2·40	518	1·28
Southampton	452	1·17	411	1·03	552	1·34	3,196	3·69	877	2·22	554	1·40	598	1·46
Staffordshire	669	1·07	742	1·10	1,290	1·84	3,832	2·79	1,863	2·62	1,880	2·65	1,791	2·45
Suffolk, East	110	0·62	197	1·02	237	1·18	584	2·04	398	1·92	242	1·16	404	1·89
,, West	83	0·86	118	1·11	122	1·11	109	1·00	149	1·36	59	0·54	101	0·90
Surrey	789	1·22	1,219	1·77	1,934	2·71	3,777	4·11	2,071	2·82	1,235	1·67	1,194	1·58
Sussex, East	166	0·75	227	1·00	347	1·47	1,091	2·19	469	1·85	393	1·55	331	1·27
,, West	140	0·86	262	1·56	287	1·65	456	2·47	430	2·32	225	1·20	272	1·40
Warwickshire	374	1·25	311	0·96	714	2·12	4,543	3·22	1,207	3·47	849	2·41	665	1·83
Westmorland	134	2·46	155	2·67	169	2·80	124	2·01	122	1·97	132	2·12	191	3·01
Wight, Isle of	44	0·56	31	0·39	69	0·83	247	2·90	154	1·81	120	1·40	202	2·31
Wiltshire	361	1·39	405	1·50	303	1·08	453	1·59	900	3·13	538	1·85	284	0·95
Worcestershire ..	199	0·76	356	1·26	699	2·38	754	1·85	989	3·26	694	2·27	605	1·93
Yorkshire, E. Riding ..	133	0·92	321	2·10	231	1·46	526	1·16	216	1·32	202	1·22	302	1·79
,, N. Riding..	331	1·22	505	1·76	843	2·84	726	1·64	537	1·72	837	2·67	808	2·51
,, W. Riding..	1,276	0·95	2,678	1·86	3,577	2·40	7,473	2·32	3,418	2·28	3,548	2·35	3,470	2·24

APPENDIX H

Table showing for each county of England, and for Wales as a whole, the numbers, and the proportion, of Districts in which either hospital- or home-isolation is the rule, or in which both methods are adopted.

		COUNTY BOROUGHS AND OTHER URBAN DISTRICTS.										RURAL DISTRICTS.									
Div.	County.	Total number of records examined.	Hosp. Group (*a*).—Places in which at least 100 cases were notified and an average of 60 per cent. or more were admitted to Hospital, 1914–1923.	Hosp. Group (*b*).—Places where notifications for period 1914–1923 were under 100.	Percentage. (Hosp. Group.)	Home Group (*a*).—Places in which at least 100 cases were notified and an average of 60% or more were treated at home during period 1914–1923.	Home Group (*b*).—Places where notifications for period 1914–1923 were under 100.	No Hospital.	Percentage. (Home Group.)	Hosp. and Home.—Places in which, on an average, the notified cases were about equally divided between Hospital and Home during the period 1914-1923.	Percentage. (Hosp. and Home Group.)	Total number of records examined.	Hosp. Group (*a*).—Places in which at least 100 cases were notified and an average of 60 per cent. or more were admitted to Hosp. 1914–1923.	Hosp. Group (*b*).—Places where notifications for period 1914–1923 were under 100.	Percentage. (Hosp. Group.)	Home Group (*a*).—Places in which at least 100 cases were notified and an average of 60% or more were treated at home during period 1914–1923.	Home Group (*b*).—Places where notifications for period 1914–1923 were under 100.	No Hospital.	Percentage. (Home Group.)	Hosp. and Home.—Places in which, on an average, the notified cases were about equally divided between Hosp. and Home during the period 1914–23.	Percentage. (Hosp. and Home Group.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	London	16	16		100·0																
S.E.	Surrey	24	23		95·8		1		4·2			7	6		85·7					1	14·3
	Kent	33	28	2	90·9	1	1		6·1	1	3·0	20	15	2	85·0		1		5·0	2	10·0
	Sussex	20	11		55·0	1	6		35·0	2	10·0	16	5	1	37·5	3	3		37·5	4	25·0
	Southants. ...	12	10		83·3	2			16·7			18	7	3	55·6	2	3		27·7	3	16·7
	Berks.	7	4		57·1		1		14·3	2	28·6	11	3		27·3	3	1		36·3	4	36·3
	Wight, Isle of ...	5	2	1	60·0		1		20·0	1	20·0	1	1		100·0						
		101	78	3	80·2	4	10		13·9	6	5·9	73	37	6	58·9	8	8		21·9	14	19·2
S.W.	Wilts.	9	6	1	77·8		1			2	22·2	13	8	3	84·6		1	1	15·4		
	Dorset	8	4	2	75·0				12·5	1	12·5	4	2		50·0		1		25·0	1	25·0
	Devon	17	7		41·2	2	5	1	47·0	2	11·8	8	3		37·5	2	1	2	62·5		
	Cornwall ...	13	1		7·7	1			76·9	2	15·4	5	1	2	100·0	2	1	2	100·0		
	Somerset	12	5		41·7		2	3	41·7	2	16·6	11	3		27·3	1	1	5	63·6	1	9·1
		59	23	3	44·1	3	10	11	40·7	9	15·2	41	16	3	46·3	4	6	10	48·9	2	4·8

	Middlesex ...	26	22	1	88·5	3	—	—	11·5	—	—	1	1	—	100·0	—	—	—	—	—	—
	Herts.	11	6	5	100·0	—	—	—	—	—	—	5	2	2	80·0	—	—	—	—	1	20·0
	Bucks.	6	3	—	50·0	—	1	1	33·3	1	16·6	4	1	1	50·0	2	—	—	50·0	—	—
	Oxford	6	1	1	33·3	—	3	—	50·0	1	16·6	7	2	3	71·4	—	2	—	28·6	—	—
	Northants. ...	11	4	2	54·5	—	1	4	45·4	—	—	10	1	—	10·0	1	3	4	80·0	1	10·0
	Hunts.	2	—	2	100·0	—	—	—	—	—	—	3	—	1	33·3	—	2	—	66·6	—	—
	Beds.	5	4	1	100·0	—	—	—	—	—	—	3	2	1	100·0	—	—	—	—	—	—
	Cambs.	1	1	—	100·0	—	—	—	—	—	—	5	2	—	40·0	1	2	—	60·0	—	—
	Isle of Ely ...	2	1	—	50·0	—	—	1	50·0	—	—	3	1	—	33·3	—	1	1	66·9	—	—
	Peterborough ...	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	100·0	—	—
		70	42	12	77·2	3	5	6	20·0	2	2·8	42	12	8	47·6	5	10	5	47·6	2	4·8
E.	Essex	26	22	—	84·6	—	2	—	7·7	2	7·7	12	9	1	83·4	—	1	—	8·3	1	8·3
	Suffolk	10	6	—	60·0	—	4	—	40·0	—	—	10	3	—	30·0	4	—	1	50·0	2	20·0
	Norfolk	9	4	1	55·6	1	1	2	44·4	—	—	9	—	—	—	1	—	8	100·0	—	—
		45	32	1	73·3	1	7	2	22·3	2	4·4	31	12	1	41·9	5	1	9	41·9	3	16·2
W.M.	Gloucester ...	12	5	3	66·7	—	3	—	25·0	1	8·3	12	5		41·7	5	2		58·3	—	—
	Hereford ...	1	1	—	100·0	—	—	—	—	—	—	8	1		12·5	2	2		50·0	3	37·5
	Salop	6	1	—	16·6	2	3	—	83·4	—	—	6	—		—	3	3		100·0	—	—
	Stafford	26	12	—	46·2	7	1	2	38·4	4	15·4	10	7		70·0	1	1		20·0	1	10·0
	Worcester ...	10	6	—	60·0	1	1	—	20·0	2	20·0	8	4		50·0	1	2		37·5	1	12·5
	Warwick ...	9	5	1	66·7	—	—	—	—	3	33·3	8	5		62·5	—	1		12·5	2	25·0
		64	30	4	53·1	10	8	2	31·3	10	15·6	52	22		42·3	12	11		44·2	7	13·5
N.M.	Rutland ...	1	—	1	100·0	—	—	—	—	—	—	1	—	1	100·	—	—		—		
	Leicester ...	6	2	—	33·3	—	4	—	66·6	—	—	5	2	—	40·0	1	2		60·0		
	Lincs.	8	3	—	37·5	3	1	—	50·0	1	12·5	8	1	—	12·5	6	1		87·5		
	Notts.	12	4	—	33·3	4	1	3	66·6	—	—	2	1	—	50·0	1	—		50·0		
	Derby	14	8	1	64·3	1	—	1	14·3	3	21·4	11	7	1	72·7	1	2		27·3		
		41	17	2	46·3	8	6	4	43·9	4	9·8	27	11	2	48·2	9	5		51·8		
N.W.	Cheshire	29	16	5	72·4	5	—	—	17·2	3	10·4	12	7	1	66·6	—	2	—	16·7	2	16·7
	Lancaster ...	83	39	4	51·8	21	2	3	31·3	14	16·9	13	7	1	61·5	2	—	1	23·1	2	15·4
		112	55	9	57·1	26	2	3	27·7	17	15·2	25	14	2	64·0	2	2	1	20·0	4	16·0
YORKS.	East Riding ...	8	2	1	37·5	1	3	—	50·0	1	12·5	4	2	2	100·0	—	—	—	—	—	—
	North Riding ...	10	5	—	50·0	2	1	1	40·0	1	10·0	9	1	—	11·1	3	3	2	88·9	—	—
	West Riding ...	65	46	13	90·8	—	4	1	7·7	1	1·5	22	17	2	86·4	—	—	1	4·5	2	9·1
		83	53	14	80·7	3	8	2	15·7	3	3·6	35	20	4	68·6	3	3	3	25·7	2	5·7
N.	Durham ...	24	20	1	87·5	1	—	—	4·2	2	8·3	9	7	—	77·8		—	—	—	2	22·2
	Northumberland...	10	5	—	50·0	3	—	—	30·0	2	20·0	5	—	—	—		1	2	60·0	2	40·0
	Cumberland ...	12	4	4	66·6	1	1	2	33·3	—	—	5	1	1	40·0		—	1	20·0	2	40·0
	Westmorland ...	7	1	5	85·7	—	—	—	—	1	14·3	3	2	1	100·0		—	—	—	—	—
		53	30	10	75·5	5	1	2	15·1	5	9·4	22	10	2	54·6		1	3	18·2	6	27·3
	Wales	49	14	1	30·6	15	8	11	69·4	—	—	34	5	—	14·7	3	9	17	85·3	—	—

APPENDIX I.

BRISTOL.—Details of illness in 60 patients who. out of a total number of 500 treated in, and discharged from, Hospital during the period June, 1923, to December, 1924, were traced and found to be suffering from subsequent disorders.

Patient	Age. M.	Age. F.	Date of Onset.	Date of Admission.	Date of Discharge.	No. of days in Hospital.	
634 A.S.		18	3.3.24	4.3.24	2.4.24	29	Pain in ankle on discharge. Under treatment 7 weeks for rheumatism. Urine tested—clear. Has not been in good health since.
719 M.T.		15	11.3.24	15.3.24	9.4.24	25	Sore throat day of discharge. Under doctor's treatment two weeks, abscess of tonsil.
580 C.H.	3½		24.2.24	29.2.24	17.6.24	109	Slight discharge from both ears about month after discharge and at times since.
147 B.S.		3	11.1.24	16.1.24	14.2.24	29	Left otorrhœa end of year.
62 I.M.	3		2.1.24	3.1.24	6.2.24	34	Severe earache, left otorrhœa week after discharge.
267 I.H.		4	27.1.24	29.1.24	29.2.24	31	Swollen ankles for a week after discharge.
828 M.H.	28		21.3.24	25.3.24	22.4.24	28	Pain in lumbar region three days after discharge, urine found to be clear. Ordered to bed, treated for bronchitis, not fit for work for a month.
176 V.F.		4	13.1.24	19.1.24	4.3.24	45	Left otorrhœa three weeks after discharge, ear has since discharged at times.
508 E.G.	7		20.2.24	22.2.24	2.4.24	40	Slight discharge from left ear.
96 G.C.		2¾	4.1.24	7.1.24	18.3.24	71	Vaginitis week after discharge. Child still has to receive careful attention.
622 C.R.	3½		28.2.24	4.3.24	9.4.24	36	Enlarged neck glands both sides few days after discharge, has been troubled more or less ever since.
522 E.R.		33	21.2.24	22.2.24	2.4.24	40	Pain in ankle for three weeks after discharge.
43 V.W.		8	29.12.23	2.1.24	13.2.24	42	Pain in head two weeks after discharge. Ears discharging at times ever since. History of tuberculosis. Child attends dispensary.

93 H.M.	2		3.1.24	5.1.24	7.2.24	30	Slight discharge right ear 10 days after discharge.
292 W.P.		7	27.1.24	6.2.24	31.3.24	54	Sore throat and pain in ear week after discharge, no otorrhœa. History of nephritis, eyes puffy, very pale at times. Not seen a doctor. Advised to seek medical help.
55 D.C.		1½	31.12.23	4.1.24	19.2.24	46	Developed swollen neck glands 10 days after discharge. Abscess incised at Royal Infirmary. In-patient 3 days. No further trouble since.
204 A.B.	4		19.1.24	22.1.24	9.3.24	47	Swelling right side of neck 10 days after discharge, treated by doctor for 6 weeks. Operation at Children's Hospital. Attended Out-patients' Department 6 weeks. Has kept well ever since.
323 R.B.	5		1.2.24	5.2.24	8.3.24	32	Discharging ears about 10 days after leaving hosp., continued for about 1 month, have been " dry " since.
947 I.B.		8	9.4.24	11.4.24	13.5.24	32	Deafness two weeks after discharge. Attended Royal Infirmary for treatment. Still has deafness when suffering from a cold.
139 I.P.		4	8.1.24	5.2.24	7.4.24	31	Slight deafness when suffering from a cold, mastoid operation performed whilst in hospital.
74 R.P.	5		20.12.23	6.1.24	30.1.24	24	Nasal discharge after return from hospital. Treated at General Hospital. Also pain in ear—no discharge.
238 S.D.	13		23.1.24	26.1.24	7.3.24	41	Had nephritis whilst in hospital. Ankles very swollen when he reached home on discharge. Taken to Children's Hospital. Urine tested, found clear. Treated for cardiac trouble. Still attending hospital.
852 D.N.	3		26.3.24	28.3.24	7.5.24	40	Swollen neck glands and otorrhœa 3 days after discharge. Two weeks later developed pneumonia. Ears have remained dry for some months.
45 V.C.	9		31.12.23	2.1.24	29.3.24	87	Had nephritis in hospital. Very drowsy for several days after discharge. Pain and swelling behind right ear. Taken to Children's Hospital on the 12th day. Operation for mastoid. In-patient for 3 months. Had a return of nephritis whilst there. Ear discharged slightly in December, 1924. Kept well since.
2220 I.W.		3/52	7.11.24	8.11.24	6.2.25	90	Taken suddenly ill in June, 1925. Pain in ear. Mastoid operation at Royal Infirmary, 7th June. In-patient 4 weeks. Has wonderfully improved.

Patient.	Age. M.	Age. F.	Date of Onset.	Date of Admission.	Date of Discharge.	No. of days in Hospital.	
2353 L.C.		4	21.11.24	25.11.24	3.1.25	39	Tonsillitis two weeks after discharge.
1714 I.S.		7	5.7.23	10.7.23	9.8.23	30	Pain in lumbar region day after discharge, attended General Hospital. Urine tested and patient prescribed for. Has been attending for same trouble more or less ever since.
2455 H.C.	6		12.11.23	16.11.23	21.12.23	35	Patient has had enlarged neck glands from time to time since discharge.
1698 J.W.	14		1.7.23	6.7.23	9.8.23	34	Tonsillitis 3 days after discharge, attended by doctor. No other trouble.
1903 V.B.		6	18.8.23	18.8.23	19.9.23	32	Has nasal discharge more or less since discharge. Treated at General Hospital.
2795 L.B.		13	28.12.23	29.12.23	1.3.24	63	In bed some time after discharge with kidney trouble. Treated by doctor. Still complains of pain in lumbar region occasionally.
2018 F.T.	8		8.9.23	13.9.23	13.10.23	30	Swollen ankles some time after discharge. Attended by doctor. Now quite well.
1568 D.M.	5		12.6.23	14.6.23	31.7.23	47	Slight heart weakness for a few weeks after discharge. Treated by doctor. Now quite well.
2096 E.P.	7		27.9.23	29.9.23	1.11.23	33	Otorrhœa 1 month after discharge. Gets a recurrence at times.
2620 N.C.	5		11.12.24	16.12.24	14.1.25	29	Nasal discharge and bad throat on arrival home from hospital. Few days later had eczema rash. 3 brothers and grandmother developed sore throats and nasal discharge. Doctor attended. (No further cases notified.)
1556 E.P.	18		10.6.23	14.6.23	14.7.23	30	Home from work for 6 months with rheumatism and heart trouble after discharge. Attended by doctor. Now does light work and keeps fairly well.
2735 M.C.		30	12.12.23	21.12.23	26.1.24	36	Slight ear discharge for a time.
2692 W.T.	9		13.12.23	17.12.23	15.1.24	29	Kidney trouble after discharge, now much better.
2755 L.C.	10		21.12.23	26.12.23	22.1.24	27	Since discharge from hospital has had inflamed eyes, is still under doctor's care.
1403 W.C.	4		7.11.23	10.11.23	12.2.24	95	Slight heart weakness for a time.
2616 I.P.		7	19.6.23	23.6.23	24.7.23	31	Had chorea September, 1924.
2137 W.T.	8		24.10.24	30.10.24	7.2.25	100	Slight heart weakness.

1726 M.P.		7	7.9.24	10.9.24	25.10.24	45	Treated by doctor for 7 weeks with some throat affection, swabs were taken—negative result.
2165 G.P.	10		30.10.24	1.11.24	1.12.24	31	Slight conjunctivitis—cleared up in a short time.
2166 R.P.	1½		30.10.24	1.11.24	12.3.25	41	Treated for 7 weeks after discharge for discharging ears. Still having treatment at Royal Infirmary.
1960 A.C.	11		7.10.24	14.10.24	8.11.24	25	Had nasal discharge. Diphtheria resulted two weeks after discharge from hospital.
1999 M.C.		¾	13.10.24	16.10.24	28.11.24	53	Slight kidney trouble. Cleared up after 2 months' treatment by own doctor.
1704 M.M.		3	3.9.24	5.9.24	29.10.24	53	Has been attending clinic several months. ? chorea.
2288 W.I.	3		?	14.11.24	5.6.25	204	Has been attending General Hospital since discharge, suffering with otorrhœa.
1759 M.K.		8	15.7.23	17.7.23	4.9.23	49	Heart trouble, still under doctor's care.
2391 D.C.		7	6.11.23	9.11.23	21.12.23	42	Slight kidney trouble.
830 W.S.	2¼		23.3.24	10.4.24	31.5.24	51	Kidney trouble, weak bladder, frequency of micturition.
1628 F.E.	4½		17.7.24	16.8.24	6.9.24	21	Rheumatism and cardiac trouble, could not attend school for nine months after discharge. Still attending Royal Infirmary once a month.
1820 L.V.	9		30.7.23	31.7.23	29.9.23	60	Slight cardiac weakness, August, 1925, stated by doctor to be due to scarlet fever.
1509 R.B.	10		1.6.23	5.6.23	11.8.23	67	Bad skin eruption one week after discharge. Treated by doctor for 4 months. No return of trouble since.
1925 G.I.		13	21.8.23	24.8.23	23.10.23	60	Did not seem to get on after discharge. Admitted Royal Infirmary August, 1925, for 2 weeks, stubborn constipation. Died of meningitis.
1296 F.M.	3		15.5.24	2.6.24	15.7.24	43	Had weak heart in hospital. Doctor says will always have weak heart. Also gets pain in lower part of abdomen. Frequency of micturition.
2373 P.C.		11	5.11.23	6.11.23	11.12.23	35	Complained of joint pains three weeks after discharge. Was in bed for 2 months with cardiac weakness and acute rheumatism.
2031 F.G.	16		13.9.23	14.9.23	29.10.23	45	Under doctor's care for pain in lumbar region a few weeks after discharge. Later history of hæmaturia. Is now in Royal Infirmary for operation.
1989 A.M.		3½	14.10.24	15.10.24	4.12.24	50	Left otorrhœa month after discharge, has been under doctor for 4 months. Ear still running. Frequency of micturition.

APPENDIX J

Table giving list of Sanitary Districts (other than Combined Districts), from which questionnaire reports have been received, and summarising the answers to questions 3–8 in the first (General Information) section of the questionnaire papers.

Following Appendices J and K will be found a list of references in which are shewn the several pages of the report where various Districts and Towns are mentioned; the list also serves as an authors' index to those from whose reports particular quotations have been made.

N.B.—Abbreviations used :—

Question 3. D = decreased; I = increased; S = stationary.

„ 4. A = agricultural; C = commercial; F = fishing; H.R. = holiday resort; I = industrial; M = mining; R = residential; S = seaport; Sh = shipping.

„ 5. +A = greater proportion of adults; +C = greater proportion of children; −C = less proportion of children; − = no change reported.

„ 6. + = hospital facilities available; − = hospital facilities lacking.

„ 8. A = after; B = before; C = about.

An asterisk against the name of a Medical Officer signifies that he is a whole-time officer.

A † against a place name signifies that there has been some change in the administration of the district since the questionnaires were received

Districts (arranged in alphabetical order of counties).	Answers to questions :—						Medical Officer of Health.
	3	4	5	6	7	8	
	Trend of population.	Character of district.	Change in age distribution.	If served by hospitals, or not.	Hospital isolation of scarlet fever started.	Scarlet fever made notifiable.	
City of London		S.		+			W. M. Willoughby*
Metropolitan Boroughs.							
Bermondsey	D.	I.	−	+		1891	R. King Brown*
Camberwell	I.	R.	−	+		1889	H. W. Barnes*
Greenwich	I.	R.I.	−	+		1899	E. G. Annis*
Hammersmith	D.	R.	−	+			J. B. Howell*
Holborn	D.	C.R.	+A	+	1889	1889	C. W. Hutt*
Islington	I.	R.I.	+A	+		„	G. C. Trotter*
Kensington	I.	R.		+			J. Fenton*
Lambeth	I.	R.I.	−	+	1893	„	J. Priestley*
†Paddington	I.	R.	+ A	+		„	R. Dudfield*
Poplar	I.	I.		+			F. W. Alexander*
St. Pancras	D.	I.	−	+	1870	„	G. Sowden*
Shoreditch	D.	R.I.	+ A	+		„	L. T. F. Bryett*
Southwark	D.	R.I.	+ A	+	„	„	H. Wilson*
Stepney	D.	I.	−	+		„	D. L. Thomas*
Wandsworth	I.	R.	−	+			F. G. Caley*
Westminster	D.		+ A	+			F. J. Allan*
†Woolwich	I.	I.	+ A	+	1889	„	J. MacMillan*

Districts (arranged in alphabetical order of counties).	Answers to questions:— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Medical Officer of Health.
Bedford.							
Boroughs and Urban Districts :—							
†Ampthill	D.	R.	—	+	1902		W. J. Taylor
Bedford	I.	R.I.	—	+	1898	1898	F. B. W. Phillips*
Kempston	S.	I.	—	+	1908	1896	G. Butters
Rural Districts :—							
Ampthill	D.	A.	—	+	1905	1896	K. Roberts
Bedford	I.	A.R.	—	+	1902	1894	W. K. Parbury
Berks.							
Boroughs and Urban Districts :—							
New Windsor		R.	—	+	1913	1891	A. D. Crofts
Buckingham.							
Boroughs and Urban Districts :—							
Aylesbury	I.	A.I.	—	+	1887	1899	T. G. Parrott
Beaconsfield	I.	R.A.	—	+	1908		A. H. Turner
Bletchley	I.	A.I.	—	—	—	1889	E. Nicholson
Buckingham	D.	A.	—	+			T. E. Pemberton
Chepping Wycombe	I.	I.	+ A	+	1898	1896	G. D. K. Bannerman
Rural Districts :—							
†Buckingham	D.	A.I.	—	+	1921	1889	P. L. Benson
Eton		A.	—	+	A.1914		A. L. Heiser
Newport Pagnell	D.	A.R.	—	+	1922	1911	C. H. F. Bailey
Cambridge.							
Cambridge B.	I.	R.	— C	+	1885	1890	A. J. Laird*
Rural Districts :—							
Caxton and Arrington	D.	A.	— C	+	1915		P. H. Dudley
Chesterton	I.	A.	—	+	1906	1889	H. R. Coombs
Linton	D.	A.	— C	+	1902	1895	P. L. Davies
Chester.							
Boroughs and Urban Districts :—							
Alsager		R.	—	+	1910	1889	H. P. Harpur
Altrincham		I.	—	+	1911		W. Reid Duncan
Ashton-upon-Mersey	I.	R.	—	+		1896	W. Scott
Bredbury and Romiley	I.	I.R.	— C	+	1889	1889	F. Cant
Buglawton	I.	A.I.	+ C	+	1909	B.1899	R. B. Davidson
Cheadle and Gatley	I.	R.A.	—	+	1903	1888	J. H. Godson
Chester C.B.	I.	R.C.		+	1899	1887	D. Rennet*
Congleton	I.	I.R.	—	+	1909	1898	P. T. Catto
Crewe	I.	I.	— C	+	1897	1896	J. D. Ingram*
Hazel Grove and Bramhall	I.	I.R.	—	+	1911	1889	T. Moore
Hoole	I.	R.	—	+	1904	,,	F. J. Butt
Hyde	I.	I.	—	+	1890	,,	N. Gebbie*
Knutsford	S.	R.	—	+			A. T. Blease
Macclesfield	D.	I.	—	+	1889	1882	J. H. Marsh
Marple	I.	R.		+	1902	1889	J. Jackson

Districts (arranged in alphabetical order of counties).	Answers to questions :— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Medical Officer of Health.
Chester—cont.							
Middlewich	I	I.	—	+	1905	1899	S. L. Melville
Mottram-in-Longdendale	D.	I.	—	+		1893	G. J. Awburn
Nantwich	D.	R.I.	—	+	1904	1899	J. D. Munro
Northwich	I.	I.	—	+	,,	1894	H. E. Gough
Sandbach	I.	I.	—	+	1909	B.1900	R. Riddell
Stalybridge	D.	I.	—	+	1890	1891	W. J. Hancock
†Stockport C.B.	I.	I.R.	+ C	+	1880	1890	A. G. Jenner*
Wallasey C.B.	I.	R.I.	—	+	1889	1889	T. W. N. Barlow
Wilmslow	I.	R.A.	—	+	1897	1890	A. Byers
Winsford	I.	A.I.	—	+	1905	,,	L. J. Picton
Yeardsley - cum - Whaley	S.	R.I.	—	+		1896	F. G. Allan
Rural Districts :—							
Bucklow	D.	A.R.	—	+			A. T. Blease
Congleton	I.	A.I.M.	—	+	1904	1889	C. H. W. Bennett
Macclesfield	I.	A.R.M.	—	+	1906	1890	R. Proudfoot
Nantwich	S.	A.		+	1907	1898	R. T. Turner
Northwich	I.	A.R.	—	+	1905	1889	H. E. Gough
Runcorn	I.	A.I.R.	— C	+	,,	1890	J. S. Manson
Tintwistle	D.	I.	—	+		1893	G. J. Awburn
Cornwall.							
Boroughs and Urban Districts :—							
†Bodmin	D.	R.A.	—	—			E. H. Hugo
Callington	S.	A.	—	—	—	1901	H. Davis
Camborne	D.	I.M.	—	+	1902	1899	J. T. Thomas
Falmouth and Truro Port				+		1889	H. V. Weakin
Fowey	S.	R.I.	A.	—	—	,,	R. T. Cann
†Helston	D.	M.A.F.	J.A.	‡	—		A. B. Preston
†Liskeard	S.	R.I.	—	—	—	,,	W. Nettle
Lostwithiel	S.	R.	—	—	—		F. H. Rudge
†Newquay		R.	—	+	1898	1891	A. Hardwick
Penryn	I.	R.	—	—		1879	J. Blamey
Penzance	D.	R.S.	—	+	1903		R. C. Lawry
St. Just	D.	M.A.	—	—	—		F. Wilkinson
Saltash	D.	R.				1912	R. T. Meadows
†Torpoint	I.	N.	—	—	—	1904	S. G. Vinter
Truro		R.	—	+	1903		H. C. Sharp
Rural Districts :—							
Bodmin	D.	A.M.	+ A	—	—	1889	J. H. Hobling
Calstock	D.	R.I.	+ A	—	—	1895	A. Bowhay
East Kerrier	S.	A.	—	—		1879	J. Blamey
†Liskeard	D.	A.	—	—		1889	W. Nettle
Redruth	D.	M.	§	+			C. H. Rivers
St. Austell		I.	—	—	—	—	E. G. Andrew
St. Columb Major		I.	—	+	1915		F. I. S. McMahon
St. Germans	S.	A.	—	—	—	1912	R. T. Meadows
Truro	D.	A.		+			A. R. Fuller

‡ Cases sent to Penzance. § Emigration of younger men.

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Cumberland.							
Boroughs and Urban Districts :—							
Arlecdon and Frizington	S.	M.A.	—	+	1883	1889	H. Robertson
Aspatria	S.	M.	—	—		1893	W. P. Briggs
Carlisle C.B.	I.	I.	+ A	+	1820	1890	J. Beard*
†Cleator Moor	S.	M.I.	—	+	1883		J. Clark
Egremont	I.	M.A.	—	+			E. A. Braithwaite
Harrington	I.	I.M.	—	+	1879	1891	G. R. Cullin
Keswick	D.	R.I.M.	—	+	1894	1890	J. R. Burnett
Millom	S.	M.I.	—	+	1906	,,	J. Pratt
Penrith	D.	R.A.	+ A	+	1870	1886	J. F. Haswell
†Wigton	S.	I.	—	—	—	1891	J. A. Gordon
Workington	I.	I.M.	—	+	1902	1889	R. W. Macpherson*
Rural Districts :—							
Bootle	I.	A.R.	—	+	1906	,,	W. A. Johnston
†Carlisle	D.	R.I.A.		+	1848	1890	J. Macdonald
Penrith	D.	R.A.	+ A	+	1870	1886	J. F. Haswell
Wigton	D.	M.	—	—	—	1903	W. P. Briggs
Derby.							
Boroughs and Urban Districts :—							
Ashbourne	I.	A.I.	—	+	1913	B.1893	E. A. Sadler
Bakewell	S.	R.A.	—	+	1897	1894	C. W. Evans
Belper	I.	I.M.	—	+	1894		R. C. Allen
Bolsover	I.	M.A.	—	+	B.1903		W. Stratton
Buxton	I.	R.	—	+	1888		T. B. Flint
Derby C.B.	I.	I.	+ A	+	1890	1880	A. E. Brindley*
Dronfield	I.	M.I.	—	+	1904	1892	O. H. Hudson
Heage	I.	A.M.I.	—	+	1894	—	R. C. Allen
Heanor	I.	I.M.	—	+	,,	1889	W. H. Turton
†Ilkeston	I.	I.M.	— C	+	1905	1890	R. de Vail King*
Long Eaton	I.	I.	—	+	1901	1889	J. Moir
New Mills	D.	I.	—	+	,,	1893	G. B. Pemberton
South Darley	D.	A.M.	—	+	—	1895	J. L. Fletcher
Rural Districts :—							
Bakewell	S.	A.R.	—	+	1904	1893	T. Fenten
Belper	D.	A.M.R.	—	+	1894	1889	R. Morrison
Blackwell	I.	M.	+ C	+		,,	A. H. Wear*
Chapel-en-le-Frith	D.	A.I.R.	—	+	1900	,,	G. Cockrane
Chesterfield	I.	M.	—	+	1905	1890	H. Peck*
Hayfield	D.	I.R.	—	+	1901	,,	G. B. Pemberton
Norton	I.	A.R.	—	+			C. Aldis
Repton	I.	A.	—	+			A. H. Holmes
Shardlow	I.	A.I.R.	—	+	1903	,,	S. Hunt
Sudbury	D.	A.		+			G. H. Herbert
Devon.							
Boroughs and Urban Districts :—							
Axminster U. and R.	S.	A.	—	+			W. Langran
Barnstaple		A.I.	—	+	1907		H. C. Jonas
Brixham		R.F.	—	+	1922	1920	J. F. Falconer
Dartmouth	S.	R.I.		+	1914	1890	J. H. Harris

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Devon—cont.							
Exeter C.B.		R.	+ A	+	1877	1889	P. H. Stirk*
Exmouth	I.	R.H.R.	—	+		1892	C. Beesley
Honiton	I.	A.R.	—	+			D. S. Steele-Perkins
†Ilfracombe	I.	R.A.F.			1896	1890	E. J. S. King
†Okehampton	I.		—	+		1891	E. H. Young
Ottery St. Mary	S.	R.A.	—	+			F. N. Sidebotham
Paignton	I.	R.	—	+	1899	1890	R. J. George
†Plymouth C.B.	I.	N.	+ A	+	1890	1889	O. Hall*
Seaton	I.	R.A.	—	+		1893	F. M. Reynolds*
†Sidmouth	S.	R.	+ A	+	1905		J. S. Withers
South Molton	I.	A.	—	—	—	—	P. H. Seal
Teignmouth	S.	H.R.	—	+	1906	1890	F. S. L. Piggott
Torquay	I.	R.	—	+	1898	1886	T. Dunlop*
Rural Districts :—							
Axminster	S.	A.	—	+			W. Langran
Barnstaple	S.	A.	—	—	—	1894	J. R. Harper
Bideford	D.	A.	—	—	—		L. B. Betts
Culmstock	D.	A.	—	+	1912	1889	S. F. Huth
Honiton	D.	A.	—	+	1915		D. Steele-Perkins
†Okehampton	D.	A.H.R.	—	—	—	1890	E. H. Young
Plympton St. Mary	I.	R.A.	—	—	1900	1896	S. N. Scott
St. Thomas	D.	A.	—	+	1903	1889	L. P. Black
Tiverton	D.	A.	—	+	1900	,,	J. R. R. Pollock
Totnes	I.	A.	—	+	1922	1910	S. C. Jellicoe
Dorset.							
Boroughs and Urban Districts :—							
Dorchester	D.	A.R.	—	+	1896	A.1897	C. D. Day
Lyme Regis	S.	R.	—	+	1917	1896	P. N. Cook
Poole	I.	I.R.	+ A	—	1888	1893	R. J. M. Horne*
Portland	D.	I.	—	+	1895	1895	T. Howard
Shaftesbury	I.	A.	—	+	1905	1889	N. I. Townsend
Sherborne	S.	R.A.	+ C‡	+	1903	,,	T. MacCarthy
Swanage	I.	R.M.Q.	—	+	1909	,,	A. S. McCausland
Wimborne Minster	S.	R.	+ A	+	1903		W. Auld
Rural Districts :—							
Blandford (and U.)		A.	?	+	?	?	L. B. Scott
Dorchester	D.	A.	+ A	+	1921	A.1908	C. D. Day
Poole	I.	R.A.	—	+	1897	1892	W. T. G. Robinson
Sherborne	D.	R.	—	+	1903	1900	G. R. Rickett
Durham.	I.	M.I.		+		1890	T. U. Hill
Boroughs and Urban Districts :—							
Annfield Plain	S.	M.	—	+	1898	1896	W. M. Morison
Barnard Castle	S.	R.	—	+		1889	C. H. Welford
Benfieldside	I.	I.	—	+	1886	1893	J. Murray
Bishop Auckland	I.	I.M.	—	+		1898	T. A. McCullagh
Blaydon	I.	I.M.	— C	+	1894	1892	J. W. H. Morrison
Brandon and Byshottles	I.	M.	—	+	1891	1891	H. Smith
†Chester-le-Street	I.	M.	—	+	1909	B.1909	D. Duncan

‡ Schools.

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Durham—cont.							
†Consett	I.	M.I.	—	+	1885	1889	A. D. Macintyre
Crook	I.	M.A.	—	+	1899	1897	R. Steel
†Darlington C.B.	I.	R.I.	— C	+	1875	1884	S. G. Mostyn*
Felling	I.	I.M.	—	+	1911	1895	W. E. Peacock
Gateshead C.B.	I.	I.M.	—	+	1881	1893	T. M. Clayton*
†Hartlepool	I.	I.	—	+	1885	1883	W. McKendrick*
Hebburn	I.	I.	—	+	1884		E. E. Norman
Hetton	I.	M.	—	+	1899	1899	R. Macleod
†Jarrow	I.	I.	—	+	1895	1878	A. K. Towers*
Leadgate	I.	M.	—	+	1886	1893	J. Murray
Seaham Harbour	I.	M.	—	+	1895	1892	L. G. Dillon
South Shields C.B.	I.	I.M.	— C	+	1883	1891	W. Nicoll*
Southwick-on-Wear	I.	I.	—	+	1902		J. J. Carruthers
Stanley	I.	M.	—	+	1900	1894	E. G. D. Benson
Stockton-on-Tees	I.	I.	—	+	1894	1899	G. C. M. M'Gonigle*
Sunderland	I.	I.M.	+ A	+	1890	1885	H. Renney*
Tanfield	I.	M.	—	+	1900	1894	E. G. D. Benson
West Hartlepool C.B.	I.	I.	— C	+	1885	1889	G. Lilico*
†Whickham	I.	I.M.	—	+	1906	1894	A. Smith
Willington	I.	M.	—	+	1903	1891	R. E. Brown
Rural Districts :—							
†Auckland	I.	M.	—	+	1900	1889	T. C. Penfold*
Barnard Castle	S.	R.M.		+	1906	1890	E. S. Hawthorne
Easington	I.	M.	—	+	1915	1893	W. Grant*
Houghton-le-Spring	I.	M.	—	+	1893	1890	F. R. V. Langenberg
†Lanchester	I.	M.	—	+			T. Buckham*
Sedgefield	I.	Q.M.A.	—	+	1906	1893	C. Basan
South Shields	I.	R.M.	—	+	1902	—	W. Armstrong
Sunderland	I.	M.Q.	—	+	1907	1889	G. W. Scott*
Weardale	D.	A.M.	—	+	1912		J. Bannerman
Ely, Isle of :							
Boroughs and Urban Districts :—							
Ely	D.	A.R.	—	+	1917	1899	F. H. M. A. Beckett
Whittlesey	S.	R.A.	—	—	—	—	C. H. Harding
Rural Districts :—							
Ely	S.	A.	—	+	1917		C. W. Howe
North Witchford	S.	A.	—	—	1883		C. E. Stephens
Thorney	I.	A.		+	1916	1875	H. Clapham
Essex.							
Boroughs and Urban Districts :—							
Barking Town	I.	R.I.	+ C	+	1893		K. Simpson*
Brightlingsea	S.	I.A.	—	+	1915	1897	E. P. Dickin
Buckhurst Hill	S.	R.	—	+	1906	1896	C. R. Dykes
Burnham-on-Crouch	I.	I.A.	—	+	1904	1898	T. D. White
Chelmsford	I.	R.I.	—	+	1902	1889	R. H. Vercoe*
†Chingford	I.	R.	—	+	1903	1896	E. J. F. Hardenberg
Clacton	I.	R.	—	+	1900	1890	W. A. Milne*
Colchester	S.	R.I.A.	—	+	B.1896	1889	W. F. Corfield*
East Ham C.B.	I.	R.		+	1893	,,	W. Benton*

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Essex—cont.							
Frinton-on-Sea	I.	R.	+ C	+	1915	1901	G. C. Bell
Harwich	S.	R.	–	+	1881	1889	G. F. Porter
Ilford	I.	R.	–	+	1898	,,	A. H. G. Burton*
Leyton	I.	R.		+	1893	1890	J. F. Taylor*
Loughton	I.	R.	–	+	1912	1903	A. B. Harris
Maldon	I.	A.I.	–	+	1903	1889	H. R. Brown
†Shoeburyness	I.	R.I.	–	+	1901	1901	E. Fountain
Southend-on-Sea C.B.	I.	R.	–	+	B.1892		C. G. Pugh*
Waltham Holy Cross	S.	R.A.I.	–	+	1905	1891	P. W. Streatfield
Walton-on-the-Naze	I.	R.	–	+	1915		J. B. C. Brockwell
Wanstead	I.	R.	–	+	1894	,,	P. F. Macgregor
†West Ham C.B.	I.	R.I.	–	+	1895	1889	C. Sanders*
Witham	I.	A.	–	+			E. C. Gimson
Wivenhoe	S.	I.	–	+		1898	G. T. Kevern
Woodford	I.	R.	+ C	+	1910	1875	R. F. V. Hodge
Rural Districts :—							
Billericay	I.	R.A.	–	+	1887	1889	J. D. Wells
Lexden and Winstree	D.	A.R.		+	1912	1890	W. H. Alderton*
Ongar	D.	A.	–	+	1913		A. S. David
Tendring	D.	A.R.		+	1912		J. Ramsbottom
Gloucester.							
Boroughs and Urban Districts :—							
Bristol C.B.	I.	R.I.M.	+ A, – C	+	1899	1890	D. S. Davies*
Charlton Kings	D.	R.	–	+			A. B. Cardew
Cheltenham	D.	R.	+ A	+	,,	1889	J. H. Garrett*
†Coleford	S.	M.	–	?	1924	B.1903	J. R. Payne
Gloucester C.B.	I.	I.R.	–	+	1903	1891	R. B. Berry*
Tewkesbury	D.	A.	–	+	1897	1896	M. Elder
Rural Districts :—							
†Marston Sicca	S.	A.	–	+	1894	1889	A. Thomson
†Northleach	D.	A.	–	+	1899	1893	E. J. R. MacMahon
Stow-on-the-Wold (pt)	D.	A.	–				R. E. B. Yelf
Hereford.							
Boroughs and Urban Districts :—							
Hereford	I.	R.	–	+	1893	1890	A. M. Brown*
Leominster		R.		+	1906	1875	R. Williams
Rural Districts :—							
Whitchurch	I.	A.R.	–	+	1920		W. H. Williams
Hertford.							
Boroughs and Urban Districts :—							
Baldock	I.	R.A.	–	+	1916	1899	B. Suggit
Barnet	I.	R.	–	+	1901	1891	C. F. Hardie
Cheshunt	I.	A.I.R.	–	+	1903	1890	J. McClymont
East Barnet Valley	I.	R.	–	+	1903	1894	A. E. Rose
Hitchin		R.	–	+	1916	1899	N. MacFadyen
†Letchworth	I.	I.R.	–	+	1916	1919	E. A. Fiddian
St. Albans	S.	I.R.	–	+	1894		R. R. K. Paton*

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Hertford—cont.							
Sawbridgeworth	S.	R.A.	—	+	1901	1889	E. Collins
Watford	I.	R.I.	—	+	1893	1891	W. J. Cox*
Rural Districts :—							
Hitchin		A.	—	+	1916		N. MacFadyen
Huntingdon.							
Ramsey U.	D.	A.R.	—	+	1903	1889	E. E. Llewellyn
Rural Districts :—							
Huntingdon	D.	A.	—	+	1919	1891	L. Newton
†Norman Cross	D.	A.	—	+			G. L. Clements
Kent.							
Boroughs and Urban Districts :—							
Beckenham	I.	R.	—	+	1881	1889	J. M. Clements*
Bexley	I.	R.	—	+	1892	,,	T. W. Hinds
†Bromley	I.	R.	—	+	1881	,,	W. S. Stalker*
Canterbury C.B.	D.	A.R.	—	+	1897	,,	F. Wacher
†Chatham	I.	I.‡	+ A	+	1883	1890	J. Holroyde*
Crayford	I.	I.	—	+			C. Melton-Ockwell
Dartford	I.	I.	—	+	1893		T. Farthing
Deal	S.	R.	—	+	1902	1895	F. M. S. Hulke
Dover	D.	R.I.	+ A	+	1872	1889	A. B. McMaster*
Erith	I.	I.	—	+	1895	1890	A. E. Jerman*
Folkestone	S.	R.H.R.	+ A	+	1878	,,	M. G. Yunge-Bateman*
Gillingham	I.	R.	—	+	1886	1899	W. A. Muir*
Gravesend	I.	I.R.	—	+		1889	C. D. Outred*
Maidstone	I.	I.A.	—	+	1882	1890	C. P. Oliver
Margate	I.	R.	—	+		,,	R. McCombe*
Northfleet	I.	I.	—	+	1907	1889	H. T. Sells
Penge	I.	R.	—	+			R. Wilkinson
Ramsgate	I.	R.	—	+			W. J. Bannister*
Rochester	I.	R.I.	+ A	+	1883	1889	S. J. Pritchett*
Royal Tunbridge Wells	D.	R.	+ A	+	1885	,,	F. C. Linton*
Sandgate	S.	R.	—	+	1898	,,	J. C. O. Bradbury
†Wrotham	S.	A.	—	+	1903	1903	E. H. Walker
Rural Districts :—							
Dartford	D.	I.R.A.			1889	1889	S. Richmond*
Faversham	I.	I.R.A.		+	1887	,,	P. G. Selby
†Hollingbourn	I.	A.	+ A	+		,,	G. M. Tuke
Malling	I.	I.A.	—	+	1896		A. H. Roberts
Sheppey	I.	R.A.	—	+	1900	1889	T. R. Wiglesworth
Lancaster.							
Boroughs and Urban Districts :—							
Abram	I.	M.	—	+	1904		A. R. Erskine
Accrington	D.	I.	—	+	1915	1882	A. Greenhalgh
Adlington	S.	I.M.	—	+	1900	1889	W. C. Rigby
Ashton-in-Makerfield	I.	M.	—	+	1883	,,	H. Winstanley
Ashton-under-Lyne	D.	I.	—	+	1890	1886	J. W. Talent*

‡ Naval and Military.

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Lancaster—cont.							
Audenshaw	S.	I.M.	− C	+	1888	1893	W. Rossell Judd
Bacup	D.	I.M.	−	+	1914	1900	J. P. Brown
Barrow-in-Furness C.B.	I.	I.	− C	+	B1907	1889	J. Orr*
Billinge	I.	M.A.	−	−	−	,,	R. O. Mather
†Blackburn C.B.	D.	R.I.M.	− C	+	1895	1882	W. A. Daley*
Blackpool C.B.	I.	R.	−	+	1878	1879	E. W. R. Jones*
Blackrod	S.	M.	−	+	1905	1889	J. W. Unsworth
Bolton C.B.	I.	I.	−	+	1884	1878	C. W. P. Moffatt*
Bootle C.B.	I.	I.	− C	+	1886	1891	F. T. H. Wood*
Brierfield	S.	I.	−	+	1899	1889	J. S. Wilson
Burnley C.B.	D.	I.M.	− C	+	1899	1884	T. Holt*
Bury C.B.	D.	I.	−	+	1881	1882	G. G. Buckley*
Chadderton	I.	I.	−	+	1900	,,	J. Wood*
Chorley	I.	I.M.	−	+	1901	1891	H. E. Middlebrooke*
†Church	D.	I.	−	+		1890	J. Craig
Clayton-le-Moors	D.	I.M.	−	+	1907	1876	E. L. Tattersall
Clitheroe	D.	I.	−	−	−	−	W. E. Barker
Colne	D.	I.	−	+		1890	W. Doyle*
Crompton	I.	I.	−	+			J. V. Buchanan
Croston	S.	I.A.	−	+	1902		A. Duckworth
Darwen	D.	I.	− C	+	1889	1887	J. Robertson*
Denton	I.	I.	−	+	1882	1892	W. Stewart
†Droylsden	I.	I.	−	+	1905	1894	K. Falconer
Eccles	I.	I.R.	−	+	1892	1889	J. E. Spence*
Failsworth	I.	I.	−	+	1899	1892	G. B. Brown
Farnworth	D.	I.	−	+	1896	1896	A. G. Glass*
Fleetwood	I.	R.I. H.R.	+ A	+	1895	1891	J. Colgan
Great Crosby	I.	R.	−	+	1890	1890	J. Huskie
Haydock	I.	M.	−	+	1893	1893	A. Dowling
Heysham	I.	R.	−	+	1900		R. Herd
Heywood	I.	I.	−	+	1912	1899	F. W. C. Brown*
Hindley	I.	M.I.	−	+	1917	,,	R. K. Nisbet*
Horwich	D.	I.M.	−	+	1905	1890	J. S. Sewell
Irlam	I.	I.A.	−	+	1904	1889	J. W. Roberts
Kirkham	S.	R.I.	−	+	1903	1905	C. Court
Lathom and Burscough	I.	A.	−	+	1906	1899	A. Speight
Lees	I.	I.	−	+			J. Currie
Leigh	I.	I.M.	− C	+	1897	1889	J. C. Beckitt*
Leyland	I.	I.	−	+		,,	C. M. Willmott
Littleborough	D.	I.	−	+	1907	1899	J. T. R. MacGill
Little Lever	D.	I.M.	−	+	1896	1896	J. S. Pickford
†Liverpool C.B.	I.	I.R.	−	+	1886	1890	E. W. Hope*
Lytham St. Annes	I.	R.	−	+	1900	,,	J. P. Litt*
Manchester C.B.	I.	I.C.	−	+	1871	1882	R. V. Clark*
Middleton	I.	I.		+	1890	1891	S. T. Beggs*
Milnrow	S.	I.	− C	+			J. Chadwick
Mossley	D.	I.	−	−	−	1889	J. Healey
Nelson	I.	I.R.	−	+	1915	B.1894	R. G. Markham*
Newton-in-Makerfield							H. E. Watkins
Oldham C.B.	I.	I.	−	+	1875	1880	J. B. Wilkinson*
Oswaldtwistle	D.	I.		+	1914	1895	A. E. Townley

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Lancaster—cont.							
†Padiham	D.	I.		+	1894	1890	N. R. Dharmavir
Poulton-le-Fylde	I.	R.	—	+	1904	1904	W. Riddell
Preesall	S.	M.	—	+	1922	1907	S. A. Nield-Faulkner
Preston C.B.	I.	I.	?	+	1907	1880	F. A. Sharpe*
†Radcliffe	D.	I.	—	+	1897	1889	J. M. Gibson*
Ramsbottom	I.	I.		+	1903	1899	H. Lawrie
Rawtenstall	D.	I.	—	+	1912	1890	J. E. Helm
Rochdale C.B.	I.	I.	—	+	1886	1889	A. G. Anderson*
St. Helens C.B.	I.	I.M.	— C	+	1882	,,	F. Hauxwell*
Skelmersdale	I.	M.	—	+	1902	1890	V. O'Reilly
Standish-with-Langtree	I.	R.I.A.	—	+	1915	1889	G. H. Ormsby
Stretford	I.	R.I.	—	+	1898	1890	E. H. Walker*
Swinton and Pendlebury	I.	I.M.	— C	+	,,	1889	H. C. Mulholland*
Thornton	I.	R.I.A.	—	+	1902	1900	F. S. Rhodes
Trawden	D.	I.	—	+	1903	1890	G. Skeen
Tyldesley-with-Shakerley	S.	M.I.	—	+	1897	1894	A. J. Lowe
Upholland	I.	M.A.	—	+	1910	1899	F. H. Browne
Warrington C.B.	I.	I.	—	+	1877	1880	G. W. N. Joseph*
Waterloo-with-Seaforth	I.	R.	—	+	1904	1889	V. J. Glover
Whitefield	S.	I.	—	+	1903	1895	A. J. Young
†Withnell	I.	A.I.	—	+	1903	1892	S. Walker-Maclean
Worsley	I.	I.M.	—	+	1894	1889	R. Sayers
Rural Districts :—							
Barton-upon-Irwell	I.	R.I.M.	—	+		1899	D. W. Davidson
Blackburn	I.	R.I. / M.A.	—	+		1896	W. R. Pollard
Burnley	D.	I.M.A.	—	+	1899	1890	H. J. Robinson
Bury	I.	I.M.A.	—	+	1903	1899	J. W. Cook
Chorley	I.	I.M.A.		+	1901	1889	J. Rigby
Clitheroe	I.	A.I.	—	—	—		J. M. Postlethwaite
Fylde	I.	I.A.R.	—	+	1902	1896	C. Court
Leigh	I.	A.M.I.	—	+	1895	1899	S. H. Ryan
Lunesdale	D.	I.R.A.	—	+	1902		B. J. Acheson
Warrington	D.	A.	—	+	1912	1892	J. Bennett
West Lancashire	I.	A.R. / R.I.	—	+	1897	1889	G. E. Scholefield*
Whiston	D.	A.M.	—	+	1887	,,	T. U. Mercer
Wigan	D.				1913	,,	G. H. Ormsby
Leicester.	I.	A.M.I.		+			T. Robinson*
Boroughs and Urban Districts :—							
†Coalville	I.	M.I.	+ A	+	1922	1892	R. W. Jamie
Hinckley	I.	I.	—	+	1896	1894	J. H. Donnell
Leicester C.B.	I.	I.	—	+	1870	1878	C. K. Millard*
Loughborough	I.	I.	—	+	1914	1899	N. B. McI. Blackham

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Leicester—cont.							
†Market Harborough	D.	I.R.	—	+			C. T. Scott
Shepshed	I.	I.	—	+	1923	1900	T. Bell.
Rural Districts :—							
Ashby-de-la-Zouch	I.	A.M.	—	+			T. Forsyth
Castle Donington	S.	A.R.	+ C	+	1921		T. J. Fletcher
Market Bosworth	I.	A.M.	—	+		B.1894	T. G. Kelly
Melton Mowbray	D.	A.	—	+	1905	1889	W. Tibbles
Lincoln.							
(Parts of Holland)							
Spalding U.	I.	R.A.	—	+			J. R. Munro
(Parts of Kesteven).							
Boroughs and Urban Districts :—							
Bourne	D.	A.	—	+	1915	1907	W. J. Gilpin
†Grantham	D.	I.	—	+	1904	A.1889	R. C. Middlemist
Rural Districts :—							
Bourne	D.	A.	— C	+		1892	J. Galletly
Branston	I.	A.	—	+			W. Sharrard
Grantham	D.	A.	—	+		1890	C. H. D. Robbs
(Parts of Lindsey)							
Boroughs and Urban Districts :—							
Barton-upon-Humber	D.	A.I.	—				F. P. H. Birtwhistle
†Cleethorpes	I.	R.	—	+	B.1904	1895	V. G. Best
Gainsborough	D.	I.	—	+	1884	1889	J. A. W. Hackett
Grimsby C.B.	I.	I.F.		+	1900	1899	B. C. Stevens*
Horncastle	D.	A.	+ A	+	1896	1889	A. Boulton
Lincoln C.B.	I.	I.		+	1907		C. J. Coleman*
†Scunthorpe and Frodingham	I.	I.	—	+	—	1891	P. G. Horsburgh*
Rural Districts :—							
Gainsborough		A.		+			H. B. W. Smith
Horncastle	D.	A.	+ A	+	1921	1889	A. Boulton
Isle of Axholme	S.	A.I.	—	—	—	1895	A. F. Messiter
Louth	D.	A.	—	—	1920	1890	W. J. Wilkinson
Spilsby	S.	R.A.	—	—	1905	,,	F. J. Walker
Welton	D.	A.	—	+			W. Sharrard
Middlesex.							
Boroughs and Urban Districts :—							
Acton	I.	R.I.	—	+	1905	1889	D. J. Thomas*
Brentford	I.	I.	—	+	1892	,,	R. C. Neil
Chiswick	I.	R.I.	—	+		1890	R. C. Leaning*
Edmonton	I.	R.I.	— C	+	1905	1891	H. W. Harding*
Enfield	I.	R.I.	—	+	1900	1890	P. P. Warren
†Finchley	I.	R.	— C	+	1889	,,	W. W. Jameson*
Friern Barnet	I.	R.	—	+	1909	,,	F. A. Spreat
†Greenford		R.A.	—	+			G. Thomson
Hampton	I.	R.I.	—	+	1903		A. D. Owen
Hampton Wick	I.	R.	—	+	1905	1890	H. A. Gumther
Harrow-on-the-Hill	I.	R.	—	+	1893	1891	C. E. Goddard
Hayes	I.	R.I.	—	+	—	1904	E. S. Phillips

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Middlesex—cont.							
Hendon	I.	R.I.	— C	+	1890	1889	T. S. McIntosh*
Heston and Isleworth	I.	R.	—	+	1898	1890	E. H. T. Nash*
†Hornsey	I.	R.	+ A	+	1889	,,	A. T. Nankivell*
Ruislip-Northwood	I.	R.	—	+			L. W. Hignett
Southgate	I.	R.	—	+	1902	1875	A. S. Ransome
Sunbury-on-Thames	I.	R.A.	—	+	1913	1889	W. L. Byham
Teddington	I.	R.	—	+	1906	1890	E. G. Gibbs-Smith
Tottenham	I.	R.I.	+ A	+	1894	1889	D. C. Kirkhope*
Twickenham	I.	R.	— C	+	1883	,,	G. H. Dupont*
Uxbridge	I.	I.	—	+	1882	1890	A. J. Turner
Wealdstone	I.	R.I.	—	+	1902	1896	R. P. N. B. Bluett
Wembley	I.	R.	—	+		1889	C. E. Goddard
Willesden	I.	R.	—	+	1892	1888	G. F. Buchan*
Wood Green	I.	R.	—	+	1898	1890	W. E. Porter*
Rural Districts:—							
Hendon	I.	R.	—	+	1902	1889	R. L. Romer
Norfolk.	D.	A.R.	— C	+		B.1907	J. T. C. Nash
Boroughs and Urban Districts:—							
Cromer	S.	R.F.	—	+	1902	1890	R. C. M. Colvin-Smith
Diss	D.	A.R.	—	—	—	1904	H. M. Speirs
Downham Market	D.	A.	—	—	—	1889	G. F. Cross
Great Yarmouth C.B.	I.	F.H.R.	— C	+	1893	,,	A. N. Stevens*
King's Lynn	D.	I.	—	+	1880	1890	P. G. Foulkes
North Walsham	S.	R.	—	+	1920	1894	J. Shepheard
Norwich C.B.	S.	R.I.	— C	+	1893	1879	H. C. Pattin*
Wells	S.	A.I.F.	—				G. Calthrop
Rural Districts:—							
Aylsham	D.	A.	—	—		1896	H. H. Back
Blofield	S.	A.	—	+	—	1891	H. H. Back
Depwade	D.	A.	—	—	—	1890	F. H. N. Maidment
Docking	D.	A.	—	—	—	1889	B.G. Sumpter
Downham	D.	A.	—	—	—	,,	G. F. Cross
Forehoe	I.	I.A.	+ A	+	1914	,,	T. L. Lack
Freebridge Lynn		A.	—	—	—	1891	O. L. Appleton
Marshland	I.	A.	—	+	1919	1889	S. R. Lister
St. Faith's	I.	A.	—	—			S. H. Long
Smallburgh	I.	A.	—	—			B. D. Z. Wright
Walsingham	D.	A.	—	—			W. H. Fisher
Northampton.							
Boroughs and Urban Districts:—							
Brackley		R.A.	—	—		1900	G. N. Stathers
Daventry	S.	A.I.	—	+	1914	1889	A. R. Darley
Desborough	S.	A.I.M.	—	—	—	,,	H. Gibbons
Higham Ferrers	I.	R.I.	—	—	—	1890	F. D. Crew
Irthlingborough	I.	I.	—	+	1901	1901	W. Gibb
Kettering	S.	I.	—	+	1886	1890	J. Allison
Northampton C.B.	I.	I.	—	+	1891	1889	J. D. McCrindle*
Oundle	S.	A.	+ C	+	1908		B. R. Turner
Raunds		I.	—	—	—	—	A. McInnes
Wellingborough	I.	I.	—	+	1872	1889	J. Arthur

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Northampton—contd.							
Rural Districts :—							
Brackley		R.A.				1896	G. N. Stathers
Brixworth	D.	A.	—	+	1913	1898	R. Winterbotham
Crick	S.	A.	—	+			A. G. L. Smith
Daventry	I.	A.	—	+		1889	A. R. Darley
Hardingstone	S.	A.I.	—	+	1894	c.1891	H. F. Percival
Middleton Cheney	I.	A.	—	—	—	1903	J. I. Johnson
Northampton		A.I.	—	+	1899	c.1891	H. F. Percival
Potterspury	D.	A.	—	—	—	—	A. H. Habgood
Towcester	D.	A.	+ A	—	—	1889	C. Simpson
Northumberland.							
Boroughs and Urban Districts :—							
Bedlingtonshire	I.	M.	—	+	—	1889	W. Hudson
Blyth	I.	I.M.	—	+			J. M. MacLachlan*
Earsdon	I.	M.	—	+	1899	1898	Taylor Dixon
Gosforth	I.	R.M.	—	+	1905	1890	W. Galbraith
Newcastle-upon-Tyne C.B.	I.	I.M.	—	+	1888	1882	H. Kerr*
Rothbury	I.	A.M.	—	+	1903	1897	F. Barrow
Seaton Delaval	I.	M.	—	+	1912	1912	A. S. Taylor
Tynemouth C.B.	I.	R.I.M.	— C	+	1904	1889	J. A. Hislop*
Wallsend	I.	I.M.S.	—	+	1893	1890	R. Rutherford*
†Weetslade	I.	M.	—	+			R. Carmichael*
Whitley and Monkseaton	I.	R.	—	+	1904	1889	J. P. Sparks
Rural Districts :—							
Alnwick	I.	A.M.	—	—	—	1892	A. Scott-Purves
Castle Ward	I.	A.M.	—	+	1906	1889	W. Holmes
Glendale	D.	A.	—	+	1911	1893	A. Dey
Hexham	I.	R.M.A.	—	+	1902	1889	J. Steedman*
Morpeth	I.	M.A.	—	—	—	,,	J. P. Philip
Norham and Islandshires	D.	A.	—	+	1921	,,	J. McWhir
Rothbury	I.	A.M.	—	+	1903	1897	F. Barrow
Nottingham.							
Boroughs and Urban Districts :—							
Arnold	I.	I.M.		+	1898	1898	H. Francis
Carlton	I.	R.I.M.	—	+	1898	1895	J. T. Knight
East Retford	S.	A.I.R.	—	+	1905	1890	H. R. Beale
†Eastwood	I.	M.	—	+	1897	1897	F. Dixon
Hucknall	I.	I.M.	—	+		1889	W. Garstang
Huthwaite	I.	M.	—	—	—	1894	R. Irvine
Kirkby-in-Ashfield	I.	I.M.	—	—	—	1896	M. E. Kayton
Mansfield	I.	I.M.		+	1894	1899	J. E. Wilson*
Mansfield Woodhouse	I.	M.	—	—	—	1890	E. H. Houfton
Nottingham C.B.	I.	I.	— C	+	1889	1882	P. Boobbyer*
West Bridgford		I.	—	+	,,	1890	W. Hunter
Worksop	I.	M.	—	+	1904	1898	T. C. Garrett

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Nottingham—cont.							
Rural Districts :—							
Blyth and Cuckney	S.	A.M.R.	—	+	1903		W. T. Wood
Stapleford	I.	I.A.		+	—		E. Kingsbury
Oxford.							
Boroughs and Urban Districts :—							
Banbury	S.	A.I.	—	+	1900	1900	A. T. Johns
Oxford C.B.	I.	R.	—	+	1886	1891	A. L. Ormerod*
Peterborough, Soke of.							
Peterborough B.	I.	I.R.	—	+	1901	1889	W. Johnstone*
Peterborough R.	I.	A.I.	—	+	1900	1875	H. Clapham
Salop.							
†Shrewsbury B.	I.	R.A.	+ A	+	1909	1894	H. G. Smith*
Somerset.							
Boroughs and Urban Districts :—							
Bath C.B.	D.	R.I.	—	+	1876	1890	J. F. Blackett*
Bridgwater	D.	I.	—	+	1882	,,	G. W. H. Bird
Burnham-on-Sea	I.	R.	—	—	—	1889	F. C. Berry
Clevedon		R.I.	+ C	+			G. Macleod
Frome	D.	I.	—	+	1888	1891	G. Walker
Highbridge		I.	—	—	—	1900	A. R. Wade
Midsomer Norton	I.	I.M.	—	—			A. Bulleid
Radstock	S.	I.M.	—	—			J. E. Scales
Taunton		A.I.	+ A	+	1879	1890	J. Allen*
Wells	D.	R.	—	+	1903	1889	H. W. Allan
†Wiveliscombe	S.	A.	—	+		,,	W. Penberthy
Yeovil	I.	I.	+ A	+	1895	1900	C. W. Gee*
Rural Districts :—							
Axbridge	D.	A.	—	—	—	1888	A. V. Lêche
Bath	I.	R.A.M.	—	+	1876	1890	J. M. Harper
Bridgwater	D.	A.R.	—	+	—	1889	W. Thompson
Chard	D.	A.I.	—	+			C. C. Court
Clutton		A.I.M.	—	—	—	—	R. V. Brew
Frome	D.	A.M.	—	+	—	1890	H. R. Codd
Keynsham	I.	R.	—	+	1896	,,	J. C. Heaven
Langport	D.	A.	—	+	1909		W. C. Lodwidge
Wells	D.	A.I.	—	+		1889	R. B. Manning
Wincanton		R.A.	—	+	1910		T. E. Coulson
Yeovil	D.	A.I.	—	—	—	—	S. C. Clapham
Southampton.							
Boroughs and Urban Districts :—							
Aldershot	D.	R.	—	+	1900		E. W. Routley*
Alton	S.	R.I.	—	+			C. W. Payne
Basingstoke	I.	I.	—	+	1889	1889	W. H. Rees-Thomas
Bournemouth C.B.	I.	R.	—	+	1886	,,	A. D. Edwards*

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Southampton— cont.							
Christchurch	I.	R.	—	+	1903	1890	R. Lloyd Legate
Eastleigh and Bishopstoke	I.	I.	—	+	1913	1893	R. R. Garrett
†Fareham	I.	A.	—	+	1922	1889	H. M. Case
Gosport	I.	R.I.	—	+	1899	,,	W. H. Lamplough
Portsmouth C.B.	I.	I.R.	—	+	1882	1883	A. M. Fraser*
Romsey	S.	A.	—	+	1900	1889	R. C. Bartlett
Southampton C.B.	I.	Sh:R.	—	+	,,	1890	R. E. Lauder*
Winchester	I.	R.	—	+	1901	1899	W. A. B. Young*
Rural Districts :—							
Alresford	D.	A.R.	+ A	+	1919	1899	F. W. Jollye
†Alton	D.	R.A.	—	+			E. J. L. Leslie
Andover	D.	A.	—	+	1912	1899	E. A. Farr
†Basingstoke	I.	A.		+	1904	1890	A. M. Moore
Catherington	S.	R.A.	+ A	+	1901	1892	C. Nash
Christchurch	S.	R.A.	—	+	1903	1890	R. L. Legate
Droxford	D.	A.	—	+	1921	1889	E. C. Pern
Fareham	I.	R.A.	—	+	1890	1890	H. D. Brook
†Fordingbridge	D.	R.A.	—	+	1914	,,	H. V. Rake
Hartley Wintney	I.	R.A.	—	+	1908	1899	M. Avent*
Hursley	I.	A.R.I.	—	+	1914	1890	J. L. Livingston
†Kingsclere	D.	R.A.	—	+	1893	1889	R. Maples
New Forest	I.	R.	—	+		1909	G. Habgood
†Petersfield	D.	R.A.	—	+	1901	1890	R. G. Cross
Romsey	I.	R.A.	—	+	1900	1889	R. C. Bartlett
South Stoneham	D.	A.	—	+	1903		A. S. Pern
Stockbridge	D.	A.	+ C	+	1923		W. K. Loveless
Whitchurch	I.	A.I.	—	+	1894		F. A. Coates
Winchester	I.	A.	—	+	1898	1890	G. A. E. Roberts
Stafford.							
Boroughs and Urban Districts :—							
Amblecote	S.	I.M.	—	+	1904	1892	H. D'Arcy Ellis
†Audley	S.	M.	—	+	1913	1890	J. Vernon
Brierley Hill	I.	I.M.	—	+	1892	1892	H. D'Arcy Ellis
Brownhills	I.	M.	—	—	—	—	R. G. Bradford
Burton-upon-Trent C.B.	I.	I.	— C	+	1885	1878	J. Macrae Cowie*
Cannock	I.	M.	—	+	1907	1899	W. M. Clendinnen*
Darlaston	I.	I.	—	+	1916	1889	V. J. Magrane
Heathtown or Wednesfield Heath	I.	I.	—	+	1894	1896	D. A. Macpherson
†Kidsgrove	I.	I.M.	—	+	1902	1889	J. Steele
Lichfield	D.	A.	—	+		1890	G. W. Homan
Quarry Bank	I.	I.M.	—	+	1899	1892	T. M. Tibbetts
Rowley Regis	I.	I.M.	+ C	+	1913	—	F. L. Keith*
Rugeley	I.	R.M.	—	+	1916	1890	R. Freer
Sedgley	I.	I.M.	—	—	—	1891	A. M. McMillan
Short Heath	I.	I.M.	—	+		1889	H. J. Dean
†Smethwick C.B.	I.	I.	— C	+	1907	1890	J. B. Ferguson*
Stafford	I.	I.R.	—	+		1880	J. T. Macnab*
Stoke-on-Trent C.B.	I.	I.M.	— C	+	B.1893	1889	G. P. Johnson
Stone	S.	A.R.	—	+	1910	1893	J. F. Fernie

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Stafford—cont.							
Tamworth	I.	I.	—	+	1893	1891	H. J. Fausset
Tettenhall	I.	A.R.	—	+	1884	1889	W. H. T. Winter
Tipton	I.	I.	—	+	,,	1899	A. S. Underhill
Uttoxeter	D.	I.R.	—	+	1916	1912	T. Bamford
Walsall C.B.	I.	I.	—	+	1919	1890	J. A. M. Clark*
†Wednesbury	I.	I.M.	—	+	1899	1900	G. E. V. Morris
†West Bromwich C.B.	I.	I.M.	—	+	1884	1890	R. W. Stocks*
Willenhall	I.	I.	—	+		1893	H. J. Dean*
Wolverhampton	I.	I.	—	+	1884	1889	R. H. H. Jolly*
Rural Districts :—							
†Cannock	I.	M.A.I.	—	+	1904	1889	W. Hosegood
Cheadle	I.	M.A.I.	—	+	,,	1890	D. M. Wilson*
Kingswinford	I.	R.I. / M.A.	—	+	1890	,,	G. Grindley
Leek	I.	A.	—	+	1894	1899	J. C. McClew
†Newcastle - under-Lyme	S.	M.A.	—	+	1912	1891	J. Gardner
Seisdon	I.	A.R.	—	+	1893	1890	R. R. Spackman
Stafford		A.		+	,,	,,	F. H. Marson
Stone	S.	A.R.	—	+	1910	1893	J. F. Fernie
Tamworth (part)	I.	A.I.M.	—	+	1893	1891	H. J. Fausset
Tutbury		A.		+	—	—	J. N. Gale
Uttoxeter	I.	A.	—	+	1916	1912	T. Bamford
Suffolk East.							
Boroughs and Urban Districts :—							
Felixstowe	I.	R.	—	+	1908	1893	G. J. Conford
Ipswich C.B.	I.	I.R.	+ A	+	1876	1890	A. M. N. Pringle*
Leiston-cum-Sizewell	I.	I.	—	+	1912	1896	H. M. Sylvester
Lowestoft	I.	I.	—	+	1888	1890	W. Stott*
Southwold	I.	R.	—	+	1903	1889	D. W. Collings
Woodbridge	S.	R.	—	+		1896	W. Redpath
Rural Districts :—							
Blything	I.	A.	—	+			J. Aylen
Bosmere and Claydon	D.	A.	—	+		1893	G. D. Shann
Hartismere				+			H. F. Barnes
†Hoxne	D.	A.	—	+	1921		F. C. James
Mutford and Lothingland	I.	A.	—	+	1901	1890	L. Gibson*
Plomesgate	D.	A.	—	+		1889	J. C. Keer
Samford	I.	A.	—	+	1900	,,	H. P. Sleigh
Woodbridge	D.	R.A.	—	+		1894	E. Hollis
Suffolk West.							
Boroughs and Urban Districts :—							
Bury St. Edmunds	D.	R.A.	—	+	1890	1889	E. Stork
Hadleigh	D.	A.	—	—	—	1895	H. F. Everett
Newmarket	D.	R.	—	+	1890	1889	J. H. Maund
Rural Districts :—							
Mildenhall	D.	A.	—	—	—	B.1912	H. Glasier

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Surrey.							
Boroughs and Urban Districts :—							
Barnes	I.	R.I.	—	+	1889	1894	E. A. F. Wilkes*
Croydon C.B.	I.	R.	—	+	1893	1884	H. P. Newsholme*
Egham	I.	R.	—	+	1911	1893	G. T. Cattell
Esher and the Dittons	I.	R.	—	+	1889	1889	A. Senior
Farnham	I.	R.	—	+	1899	1891	S. G. Sloman
Frimley	S.	R.	—	+	1902	1895	F. Churchill-Davidson
Godalming	I.	R.	—	+		1892	T. M. Bonar
Kingston-on-Thames	I.	R.I.	+ A	+	1906	1888	E. W. Matthews*
Merton and Morden	I.	R.		+	1899		R. T. Davison
Richmond	I.	R.	—	+	1898	1889	C. S. Brebner*
Surbiton	I.	R.	+ C	+	,,	1890	N. H. Linzee
Sutton	D.	R.	+ A	+	1890	1878	W. Habgood*
The Maldens and Coombe	I.	R.I.	—	+	1898	1891	T. R. Davison
Wimbledon	I.	R.		+	1879	1890	A. Gilmour*
Rural Districts :—							
Godstone	I.	A.R.	—	+	1897	1894	F. W. Robertson
Hambledon	I.	A.R.	—	+	1890	1890	T. M. Bonar
Sussex East.							
Boroughs and Urban Districts :—							
Bexhill	I.	R.	—	+	1896	1889	G. H. Weston
Brighton C.B.	I.	R.	+ A	+	1881	1891	Duncan Forbes*
Eastbourne C.B.	I.	R.	+ A	+	1884	1889	W. G. Willoughby*
Hastings C.B.	I.	R.	+ A	+	1897	1891	G. R. Bruce*
Lewes	S.	R.	—	+	1875	1890	W. A. Dow
Newhaven	S.	I.Sh.	—	+	1906	,,	R. Parkhurst
Rye	D.	A.R.	—	+	1907	1889	T. T. Harratt
Rural Districts :—							
Rye	D.	A.R.	—	+	,,	1899	W. Wynne
Sussex West.							
Boroughs and Urban Districts :—							
Bognor	I.	R.	—	+	1910	1891	T. P. Cole*
Chichester	S.	R.	—	+	1888	1890	A. M. Barford
Worthing	I.	R.	—	+	1896	,,	R. H. Wilshaw*
Warwick.							
Boroughs and Urban Districts :—							
Birmingham C.B.	I.	I.	+ A	+	1875	1890	J. Robertson*
Coventry	I.	I.	+ A	+	1874	,,	E. H. Snell*
Nuneaton	I.	I.M.	—	+	1897	1889	K. E. Tapper*
Royal Leamington Spa	I.	R.	—	+	1887	1890	W. L. M. Goldie*
Sutton Coldfield	I.	R.	—	+	,,	1894	J. H. Wright
Rural Districts :—							
Alcester	I.	A.I.	—	+	1886		R. H. Spencer
Coventry		A.I.		+			W. P. Elford*

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Wight, Isle of.							
Boroughs and Urban Districts :—							
†East Cowes	S.	I.	—	+	1918	1899	J. A. Gibson
†Newport	S.	I.	—	+	1911		S. Foster
Ryde	I.	R.	—	+	1872	1890	L. P. L. Firman-Edwards
Shanklin	I.	R.	—	+	1903	1894	J. Cowper
Rural Districts :							
†Isle of Wight	D.	A.	—	+	1911	1899	J. A. Gibson
Wilts.							
Boroughs and Urban Districts :—							
Bradford-on-Avon	I.	I.	—	+	1900	1916	W. J. A. Adye
Calne		I.	—	+	1888	1890	R. S. Ferguson
†Chippenham		R.I.	—	+	1899	C.1899	W. T. Briscoe
Devizes		R.		+	1905		G. S. A. Waylen
Malmesbury	D.	A.	—	+		1920	R. M. Moore
Salisbury	I.	R.	—	+	1912	1889	E. T. Fison
Swindon	I.	I.	+ A	+	1889	,,	D. Brewer*
†Trowbridge	I.	I.	—	+	1893	1890	R. M. Wright
Wilton	S.	I.	+ A	+	C.1912		A. W. K. Straton
Rural Districts :—							
Bradford-on-Avon	I.	A.	—	+	1900	1916	W. J. A. Adye
Calne		A.	—	+	1888	1890	R. S. Ferguson
Chippenham	—	R.I.	—	+	1899	C.1899	W. T. Briscoe
Devizes	D.	A.R.	—	+	1906	1890	G. S. A. Waylen
Highworth		A.	—	+	1902		R. P. Beatty
Malmesbury	D.	A.	—	+		1920	R. M. Moore
Mere	D.	A.	—	—	—	1889	B. P. Bartlett
Salisbury	S.	A.R.	—	+	1912	,,	J. E. Gordon
Tisbury	D.	A.	—	+	1914	1895	J. I. F. Knight
Wilton	S.	A.	—	+	C.1912		A. W. K. Straton
Worcester.							
Boroughs and Urban Districts :—							
Bewdley	S.	I.R.A.	—	+			U. M. N. Miles
Dudley C.B.	I.	I.M.	—	+	—	1899	P. S. Blaker*
Kidderminster	D.	I.	—	+	1883	1889	J. R. Craig
Lye and Wollescote	I.	I.	—	+		B.1897	H. C. Darby
Malvern	I.	R.	—	+	1896		C. R. P. Mitchell
†Oldbury	I.	I.R.	—	+	1907	1890	G. B. Buttery
Redditch	I.	I.	—	+	1901	1899	H. E. Collier
†Stourbridge	I.	R.	—	+	1902	1901	J. R. Sinton
Worcester C.B.	I.	I.	+ A	+	1898	1890	M. Read*
Rural Districts :—							
Droitwich	D.	R.A.	—	+	1903	1898	J. Wilkinson
Halesowen	I.	I.	—	+	1900	1895	T. B. Young
Martley	D.	A.	—	+			A. S. Green
Upton-on-Severn		A.	—	+	1904	1890	G. Davidson

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Yorks (East Riding)							
Boroughs and Urban Districts :—							
Beverley		I.	—	+	1923	1893	H. L. Munro
Bridlington	I.	R.F.	—	+	1900	1900	A. Kaye Jarratt
Filey	I.	R.A.F.	—	+	1919	1889	J. T. Haworth
Hornsea	I.	R.A.	—	+	1919	1900	H. D. Johns
†Kingston-upon-Hull C.B.	I.	I.S.	—	+	1887	1890	J. W. Mason*
Norton	D.	R.A.	—	+		1894	R. H. F. Bostock
Withernsea	I.	R.	—	+	1918	1898	A. L. Sproulle
†York C.B.	I.	R.I.	—	+	1881	1885	E. M. Smith*
Rural Districts :							
Beverley		A.R.	—	+			F. G. Dobson
Bridlington	D.	A.	— C	+	1911	1893	G. D. H. Chapman
Howden	I.	A.	—	+	1903	1894	R. B. Brown
Yorks (North Riding)							
Boroughs and Urban Districts :—							
Kirklington - cum - Upsland	S.	A.R.	—	—	—	—	A. H. Sevier
Middlesbrough C.B.	I.	I.	—	+	1877	1889	C. V. Dingle*
Northallerton	S.	A.R.	—	+	1884	1898	W. Baigent
Scalby		A.R.	—	+	1904	1902	B. G. Forman
Scarborough	I.	R.	—	+	1880	1889	S. F. Linton*
Whitby	I.	R.	—	+	1886	,,	J. G. Ross
Rural Districts :—							
Aysgarth	S.	A.	—	+	1908	1908	D. Dunbar
Easingwold	D.	A.R.	— C	+	1915	1890	E. B. Hicks
Helmsley	D.	A.R.	—	+		1894	J. F. Porter
Leyburn	S.	A.	‡	+	1922	1896	G. Cockcroft
Northallerton	D.	A.	‡	+	1910	,,	J. A. Hutchinson
Pickering	D.	A.R.	—	—	—	1897	R. A. Scott
Reeth	I.	A.	—	—	—	—	G. J. Sturrock (Miss)
Startforth	S.	A.R.	—	+	1911	1890	E. S. Hawthorne
Wath	D.	A.	—	+	B.1899	B.1894	T. C. Mitchell
Yorks (West Riding)							
Boroughs and Urban Districts :—							
Ardsley, East and West	I.	I.	—	+	B.1894	1898	B. G. Ewing
Baildon	I.	R.	—	+		1891	E. G. Firth
Barkisland	S.	I.	—	+	1904	1889	J. Hoyle
Barnoldswick	I.	I.	—	+	1902	1895	H. C. Alderton
Barnsley C.B.	I.	M.I.	— C	+	1891	1889	T. E. Francis*
Bingley	I.	I.	—	+	1897	,,	H. Angus
Birkenshaw		R.I.A.	—	+			J. Barclay
Bradford C.B.	I.	I.	— C	+	1887	1881	J. J. Buchan*
†Brighouse	D.	I.	—	+	1899	1890	F. A. Belam
Castleford	I.	I.M.	—	+	1907	1889	W. Kemp
Conisbrough		M.	—	+		1921	J. McArthur

‡ Younger men to towns.

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Yorks (West Riding)—cont.							
Darton	I.	M.	—	+	1901	1890	R. Millar
†Dewsbury C.B.	I.	I.	—	+	1905	—	O. M. Holden*
Doncaster	I.	I.	—	+	1895	1893	D. L. Anderson*
Earby	D.	I.A.	—	+			A. Falconer
Emley	I.	M.A.	—	+			J. A. Smith
Flockton	S.	M.	—	+			,,
Gildersome		I.M.	—	+			W. H. Holliday
Goole	D.	I.	—	+			A. M. Erskine
†Greasbrough	S.	M.A.	—	+	1900	1891	E. B. Jago
†Greetland	S.	I.	—	+			H. N. Ingham
Guiseley	I.	R.I.	—	+	1900	1889	W. H. Cheetham
Halifax C.B.	S.	I.	−C +A	+	1873	1882	C. Banks*
Harrogate	I.	R.	—	+		1896	J. Mair*
Hebden Bridge	D.	I.	—	+	1895	1890	F. J. Dowdall
Hemsworth		M.A.	+ C	+			H. P. Wiltshire
Holmfirth	D.	I.	—	+	1904	1890	H. W. Williams
Horbury	I.	I.	—	+	1905	1892	H. L. Neil
Hunsworth	D.	R.I M.A.	—	+	1894	1894	J. Barclay
Ilkley	I	R.	—	+	1888	1889	H. T. Bates
Keighley	D.	I.	—	+	1897	1890	W. Scatterty*
†Kirkburton		I.M.	—	+	—	—	F. S. B. Fletcher
Kirkheaton	I.	I.A.	—	+	1902	1894	J. E. Taylor
Knaresborough		R.	—	+			I. D. Mackay
Leeds C.B.	I.	I.	−C	+	1898	1894	J. J. Jervis*
Mexborough	I.	M.	—	+			J. J. Huey
Mirfield	I.	I.R.	—	+	1895	1890	L. J. Milne
Morley	D.	I.	—	+	1893	1897	S. T. Steele
Pontefract	I.	M.	—	+	1901	1889	W. T. Hessel
Queensbury	D.	I.	—	+	1894		J. J. Murphy
Rawmarsh	I.	I.M.	—	+	1888	1890	G. H. Menzies
Ripon	I.	R.	—	+	1899	B.1899	W. D. Jefferson
†Rotherham C.B.	I.	I.M.	—	+	,,	1879	A. Robinson*
Rothwell	I.	M.	+ A	+	1904	1890	H. Stevenson
Royston	I.	M.	—	+			R. B. Eskrigge
Sheffield C.B.		I.M. R.A.		+	1883	1889	F. E. Wynne*
Shipley	I.	R.	—	+	1891	,,	W. Foster*
South Crosland	S.	I.A.	—	+	1904	,,	W. H. Smailes
Soyland	S.	I.	—	+	1909	,,	J. Hoyle
Spenborough		I.M.	—	+			L. Pick*
Springhead	D.	I.A.	—	—	—	B.1893	W. Oliver
Stanley and Wakefield	I.	I.M.	—	+	1892	1880	J. J. Jackson
Thurlstone	S.	R.I.M.	—	+	1905		A. C. J. Wilson
Tickhill	I.	R.A.M.	—	+	1906	1889	T. A. Caley
Todmorden	D.	I.	—	+	1894	1891	C. L. Williams*
Wakefield C.B.	I.	I.	— C	+	1883	1887	T. Gibson*
Wombwell	I.	M.	—	+	1901	1889	J. C. Pickup
Worsborough	I.	M.	—	+	1891	1890	H. A. L. Banham
Yeadon	I.	I.	— C	+	1904	1893	A. J. I. Muschamp
Rural Districts:—							
Bowland	I.	A.I.	—	—	—	—	W. H. Ross

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Yorks (West Riding)—cont.							
†Halifax	I.	I.	—	+	1894	1894	F. A. Storr
Hemsworth		M.A.Q.	—	+	1889	1889	W. R. Gardner
Hunslet	D.	I.M.	—	+	1904	1890	J. Buck
Kiveton Park	I.	M.A.	—	+	1900	—	W. T. Wood
Pateley Bridge	D.	A.	—	+	—	1890	G. Lumsden
Rotherham	I.	M.A.	—	+	1898	1897	L. J. Weatherbe
Thorne	I.	M.A.	—	+	1904	B.1899	J. M. Taylor
Todmorden	D.	I.	—	+	1895	1890	F. J. Dowdall
Wetherby	D.	A.R.	—	+	1898	1889	J. A. Hargreaves
Wharfedale (North)	I.	A.	—	+	1904	,,	H. Wolfe
,, (South)	I.	A.R.	—	+	1900	,,	W. H. Cheetham
Wortley	I.	I.M.	— A	+	1894	1890	A. Anderson*
WALES.							
Anglesey.							
Boroughs and Urban Districts :—							
Amlwch		A.Sh.	—	+	1924	1899	T. Jones
Menai Bridge	I.	R.F.	—	+	,,	1889	P. A. Newton
Rural Districts :—							
Twrcelyn	D.	A.	—	+	,,	1899	T. Jones
Brecknock.							
Brecknock B.	I.	A.R.	—	+	—	1890	T. P. Thomas
Rural Districts :—							
Brecknock(Devynock)	D.	A.	—	+	—	,,	,,
,, (Llangorse)	S.	A.	—	+	—	,,	,,
Hay	I.	A.	—	+			F. J. Jayne
Vaynor and Penderyn	I.	A.M.	—	+	1910	1889	W. W. Jones
Cardigan.							
Aberystwyth U.	I.	R.	—	+	1913	1890	A. Thomas
Rural Districts :—							
Aberayron	D.	A.	—	—	—	—	W. J. Davies
Aberystwyth (North)	D.	A.	—	—	—	1891	J. James
,, (South)	D.	A.	—	—	—	1889	J. A. Rees
Cardigan	S.	A.	—	—	—	—	D. Ll. Davies
Lampeter	S.	A.	—	—	—	1899	E. C. Thomas
Llandyssil	D.	R.A.	—	—	—	1904	A. T. Evans
Carmarthen.							
Boroughs and Urban Districts :—							
Burry Port	I.	I.M.	—	—	—	—	C. M. Williams
Carmarthen	D.	R.	—	—	—	1892	L. M. Bowen-Jones
Llanelly	I.	I.	—	+	1922	1888	L. W. Pole*
Rural Districts :—							
Carmarthen	S.	A.M.	+ A	—	—	1892	L. M. Bowen-Jones
Llanelly	I.	I.M.	—	—	—	—	E. Evans
Llanybyther	S.	A.	—	—	—	1899	E. C. Thomas
Whitland	D.	A.	—	—	—	—	W. D. Owen

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Carnarvon.							
Llandudno	I.	R.H,R.	—	+	1886	1910	G. Lewis Travis*
Denbigh.							
Boroughs and Urban Districts :—							
Colwyn Bay and Colwyn	I.	R.	+ A	+	1905	1899	W. M. Venables-Williams
Ruthin	D.	R.A.	—	—	—	1896	W. F. Byford
Rural Districts :—							
Ruthin	I.	A.	—	+	—	—	T. O. Jones
Uwchaled	D.	A.	+ A	+	1922	1889	E. R. Lloyd
Wrexham	I.	A.R. M.I.	+ A	+	1886	1890	T. P. Edwards*
Flint.							
Borough and Urban Districts :—							
Prestatyn	I.	R.I.	—	+	1909		J. Tudor Griffiths
Rhyl	I.	R.	—	+	1895	1890	E. H. Jones
Rural Districts :—							
Hawarden	I.	R.I.M.	—	+	1910	1895	E. B. Roberts
Holywell (Holywell Div.)		A.I.M.	—	—	—	—	F. G. Norbury
Overton	I.	A.	—	+	1918	—	R. Moreton
Glamorgan.							
Boroughs and Urban Districts :—							
Aberdare	I.	M.	—	+	1873	1898	J. Ll. Prichard*
Barry	I.	I.Sh.	—	+	1912	1890	P. W. Kent*
Bridgend	I.	R.M.	—	+	1907	1893	J. S. Peebles*
Caerphilly	I.	R.M.	—	+	1909	,,	T. W. Thomas
Cardiff C.B.	I.	C.	—	+	1892	1889	R. M. F. Picken*
Cowbridge	I.	R.I. M.A.	—	+	1902	,,	D. J. Evans
Gelligaer	I.	I.M.	—	+	1914	1899	J. H. Rankin*
Merthyr Tydfil C.B.	D.	I.M.	— C	+	1907	1891	A. Duncan*
Mountain Ash	I.	M.	—	+	1893	1889	R. L. Williams*
Neath	I.	I.R.	—	—	—	1873	J. M. Morris*
Ogmore and Garw	I.	M.	— C	—	—	1899	W. A. Murphy*
Penarth	I.	R.	—	+	1904	1894	C. A. Jones
Pontypridd	I.	M.	—	+	1913	1889	E. J. Griffiths*
Port Talbot		I.M.	+ C	+	1897	,,	E. W. Richards*
Rhondda	I.	M.	— C	+	1909	1894	J. D. Jenkins*
Rural Districts :—							
Cowbridge	I.	R.I. M.A.	—	+	1902	1889	C. B. Meller
Neath	I.	A.I.M.	—	—	—	—	J. Griffiths*
Penybont	I.	R.M.	—	+	1907	1893	J. S. Peebles*
Swansea	D.	I.M.	—	+	1904	1889	J. M. Macpherson
Merioneth.							
Urban Districts :—							
Dolgelly	D.	A.	—	—	—	1899	H. Jones
Mallwyd	S.	A.	—	—			J. Jones

Districts (arranged in alphabetical order of counties).	Answers to questions:— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Medical Officer of Health.
Merioneth—cont.							
Towyn	I.	A.R.Q.	—	—	1894		J. A. Davies
Rural Districts :—							
Dolgelley	D.	M.A.	—	—	—	1899	H. Jones
Monmouth.		H.M.A.		+			D. R. Jones*
Boroughs and Urban Districts :—							
Abercarn	I.	I.M.	+ C	+	—	1892	E. M. Griffiths
Abergavenny	I.	R.	—	+			W. D. Steel
Abersychan	I.	M.I.A.	—	—		1889	R. J. S. Verity
Abertillery	I.	I.M.	+ A	+	1912	1900	T. B. Smith
Bedwas and Machen	I.	M.	—	+	1913	1913	B.Osmond-Barnard
Bedwellty	I.	M.	+ C	+	1915		D. R. Roberts
Blaenavon	I.	M.	—	—	—	1891	G. H. Martin
Caerleon	I.	A.R.	—	+	—	—	E. A. I. Phillips
Chepstow	I.	A.R.I.	—	+	1902	—	T. L. Drapes
Ebbw Vale	I.	I.M.	+ A	+	—	—	R. M. Fonseca*
Nantyglo and Blaina	I.	M.	—	—	—	—	T. W. Bevan
Newport C.B.	I.	I.Sh.R.	— C	+	1896	1890	J. Howard-Jones
Panteg	I.	I.M.	—	+	—	—	T. J. McAllen
Pontypool	I.	I.	—	+	—	—	T. J. McAllen
Rhymney	S.	M.	—		—	B.1904	R. V. de Acton-Redwood
Risca	I.	I.M.	—	+	1896	1893	N. N. Wade
Usk		R.	—	+	—	—	E. L. M. Hackett
Rural Districts :—							
Abergavenny	I.	R.A.	—	+	1894	1894	E. Y. Steele
Chepstow	I.	A.I.R.	—	+	1902	—	T. L. Drapes
Magor	I.	A.	—	+	—	—	E. A. I. Phillips
Pontypool	I.	A.	—	+	—	—	E. L. M. Hackett
Saint Mellons	D.	A.I.	—	+	1904	1900	N. N. Wade
Montgomery.							
Boroughs and Urban Districts :—							
Llanfyllin	S.	A.R.	— A	+	1922	1898	F. F. Jones
Montgomery	S.	A.R.	—	+	—	—	T. D. Kirk
Newtown and Llanllwchaiarn	D.	A.I.	—	+	—	—	A. Shearer
Welshpool	D.	A.	—	+	1924	—	J. A. Crump
Rural Districts :—							
Forden	D.	A.	— C	+	1920	1899	R. D. Thomas
Llanfyllin	D.	A.I.M.	— A	+	1922	1898	F. F. Jones
Pembroke.							
Boroughs and Urban Districts :—							
Narberth	S.	A.	—	—	—	—	W. V. Morgan
Pembroke	D.	I.	—	—	1901	—	E. A. Saunders
Tenby	D.	R.	—	+	,,	1890	E. M. Knowling
Rural Districts :—							
Narberth	I.	A.	—	—	—	B.1904	E. W. Price
Pembroke	I.	A.	—	—	—	—	W. R. E. Williams
St. Dogmells	S.	A.	—	+	—	—	D. Havard
Radnor.	I.	A.	—	+	—	—	J. W. Miller*
New Radnor R.	S.	A.	—	—	—	—	B. Fawssett

APPENDIX K

List of (i) Combined Sanitary Districts, and of (ii) Groups of two or more Sanitary Districts mostly under one whole-time Medical Officer, concerning which information has been received.

Districts (arranged in alphabetical order of counties.)	Answers to questions:— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of Scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
(i) *Combined Sanitary Districts.*							
Berks : East.							J. J. Paterson
Maidenhead B.	I.	R.	—	+	1880	1889	
Wokingham B.					1923		
Cookham R.					1904		
Easthampstead R.					1912		
Windsor R.					,,		
Wokingham R.					1923		
Berks : West.							W. Sisam
Abingdon B.	I.	A.	—	+	1901	1890	
Newbury B.	I.	A.R.	—	+	1895	1900	
Wallingford B.	S.	A.	—	+	1905	1893	
Wantage U.	I.	A.	—	+	1909	—	
Abingdon R.	I.	A.R.	—	+	1901	1890	
Bradfield R.	I.	A.R.	—	+	1914	1889	
Hungerford R.	D.	A.R.	—	+	,,	1890	
Newbury R.	S.	A.R.	—	+	1895	,,	
Wallingford R.	I.	A.R.	—	+	1905	,,	
Wantage R.	D.	A.R.	—	+	1909	,,	
Cheshire, N.W.							J. B. Yeoman
Bebington U.	I.	I.	+ C	+	1889	1899	
Bromborough U.		I.					
Ellesmere Port and Whitby U.		I.					
Hoylake and West Kirby U.		R.					
Neston and Parkgate U.		R.					
Wirral R.		R.					
Cheshire, S.W.							W. E. Burton
Tarporley U.	I.	A.I.	—	+	1906	1899	
Chester R.							
Malpas R.							
Tarvin R.							
Cheshire and Derbyshire							G. B. Pemberton†
Disley R.	S.	R.I.	—	+	1909	—	
Hayfield R.	D.	R.I.	—	+	1901	1890	
Essex							P. J. Gaffikin
Braintree U.	I.	I.	—	+	1900	B.1913	
Braintree R.		A.	—	+	,,	,,	
Dunmow R.		A.	—	+	1906	,,	

† Part-time.

Districts (arranged in alphabetical order of counties).	Answers to questions:— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
Essex, S.E.							J. F. Macdonald
Chelmsford R.	I.	A.R.		+		1890	
Maldon R.	S.	A.		+			
Rochford R.							
Gloucester South.							T. Rhind
Chipping Sodbury R.	D.	A.M.	—	+	1900	1889	
Thornbury R.					1920	,,	
Gloucester East.							H. F. W. Adams
Cirencester U.			—	+	1878	1889	
Tetbury U.		A.					
Cirencester R.	D.		—	+	,,	,,	
Dursley R.			—	+	1896	,,	
Tetbury R.							
Wheatenhurst R.			—	+	1885	,,	
Gloucester West.							O. W. Andrews
Awre U.		R.A.		+			
Newnham U.		R.A.		+			
Westbury-on-Severn U.		R.A.		+			
East Dean and United Parishes R.	I.	R.A.M.		+	1899	1891	
Gloucester R.		R.A.		+			
Lydney R.		I.		+			
Herefordshire.							J. H. Jones
Bromyard R.			—	+	1897		
Dore R.			—	+			
† Hereford R.	D.	A.	—	+	1904	1899	
Ledbury R.			—	+			
Leominster R.			—	+			
Weobly R.			—	+			
Kent East (*No.* 1).							A. M. Watts
Broadstairs and St. Peter's U.		R.	—	+			
Herne Bay U.	I.	R.	—	+	1894	1889	
Blean R.		R.A.	—	+			
Isle of Thanet R.		R.A.	—	+			
Kent East (*No.* 2).							J. J. Day
Bridge R.			—	+	B		
Dover R.	I.	R.A.I.	—	+	1911	1889	
Eastry R.			—	+			
Kent East (*No.* 3).							J. MacDougall
Ashford U.		I.		+	1878	1878	
Cheriton U.		I.		+	1902	1899	
Hythe B.		R.	+ A		—	1892	
East Ashford R.	I.	A.		+	1888	1891	
Elham R.		A.		+	1893	1892	
West Ashford R.		A.		+	1895	,,	

Districts (arranged in alphabetical order of counties).	Answers to questions :— 3 Trend of population.	4 Character of district.	5 Change in age distribution	6 If served by hospital, or not.	7 Hospital isolation of Scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
Kent N.E. Milton and Sittingbourne.							A. J. Wernet
Milton Regis U.	I.	A.I.	—	+			
Sittingbourne U.							
Milton R.							
Kent N.E.							W. C. D. Hills
Queenborough B.	I.	I	—	+	1912	1889	
Sheerness U.		R.	—				
Kent S.W.							S. N. Galbraith
Southborough U.	I.	R.A.		+		1899	
Tenterden B.							
Tonbridge U.							
Cranbrook R.							
Maidstone R.							
Tenterden R.							
Tonbridge R.							
Kent W.							P. N. Cave
Chislehurst U.	I.	R.A.	—	+	1903		
Sevenoaks U.							
Sidcup U.					1882		
Bromley R.					1907		
Sevenoaks R.							
Lancashire C.D.							G. H. Patterson
Dalton-in-Furness U.		R.M.A.	—	+	1898	1889	
Grange U.							
Ulverston U.							
Ulverston R.							
Leicestershire. (including Northampton, Rutland and Warwick)							J. E. O'Connor
No. 12							
Melton Mowbray U.	I.	I.A.	—	+	1896	1890	
Oadby U.							
Oakham U (Rutland)							
Thurmaston U.							
Wigston Magna U.					1895		
Barrow-on-Soar R.							
Billesdon R.							
Blaby R.							
GrettonR.(Northants)							
Hallaton R.							
Hinckley R.		I.A.			1895		
Lutterworth R.							
Monks Kirby R. (Warwick)					1912		
Oakham R. (Rutland)		A.I.					
Uppingham „		R.					

Districts (arranged in alphabetical order of counties).	Answers to questions :— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
Oxfordshire N.							E. Morton
Chipping Norton B.	D.	A.R.	–	+		1889	
Witney U.		I.					
Woodstock B.		A.R.					
Banbury R.		Q.					
Chipping Norton R.		A.R.					
Witney R.		I.					
Woodstock R.		A.R.					
Oxfordshire S.							W. H. Hill
Henley-on-Thames B.	D.	R.		+	B.1912	1899	
Bicester U.		A.					
Thame U.		A.					
Wheatley U.		A.					
Bicester R.		A.					
Crowmarsh R.		A.					
Culham R.		A.					
Goring R.		R.					
Headington R.		I.					
Henley R.		R.					
Thame R.		A.					
Shropshire, N.E.							A. E. White
Dawley U.	I.	A.I.M.	–	+			
Newport U.							
Oakengates U.							
Wellington U.							
Newport R.							
Shifnal R.							
Wellington R.							
Shropshire							A. E. White
Ludlow B. (Salop)	I.	A.I.M.	–	+	1922		
Ludlow R. „							
Surrey (*Chertsey*).							H. Hanslow Brind
Chertsey U.	I.	R.A.I.		+	1882	1890	
Walton-on-Thames U.							
Weybridge U.							
Windlesham U.							
Chertsey R.							
Surrey (*Dorking*)							J. Williamson
Carshalton U.	I.	R.A.	– C	+	1897	1889	
Dorking U.					1903		
Epsom U.					1894		
Leatherhead U.					1897		
Dorking R.					1903		
Epsom R.					1897		

Districts (arranged in alphabetical order of counties).	Answers to questions :— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
Sussex East.							H. Stott
Cuckfield U.							
Hayward's Heath U.							
Uckfield U.							
Battle R.							
Cuckfield R.							
Eastbourne R.							
East Grinstead R.	I.	A.R.	—	+	1911	1889	
Hailsham R.							
Newhaven R.							
Ticehurst R.							
Uckfield R.							
Burgess Hill U.							
Seaford U.							
Sussex West (Northern).							S. Child
Horsham U.					1920	1896	
Horsham R.			+ A		,,	1890	
Midhurst R.	D.	R.A.	+ C	+	,,	,,	
Petworth R.					—	1891	
Thakeham R.					1920	1890	
Sussex West (Southern).							W. J. Butcher
Arundel B.							
Littlehampton U.							
Southwick U.							
Steyning West R.	I.	R.A.	—	+	B.1912	1899	
Westbourne R.							
Westhampnett R.							
Warwickshire.							H. Gibbons Ward
Kenilworth U.							
Rugby U.					1911		
Warwick B.					1888		
Meriden R.	I.					1889	
Rugby R.					1911		
Solihull R.					1878		
Southam R.							
Warwick R.							
							W. B. Cockill
Westmorland.							
Ambleside U.							
Appleby B.					1899		
Grasmere U.					1881		
Kendal B.	I.	R.I.	+A.	+	1882		
Kirkby Lonsdale U.		A.					
Shap U.							
Windermere U.					1882		
East Westmorland R.							
South Westmorland R							
West Ward R.							

Districts (arranged in alphabetical order of counties).	Answers to questions :— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
Wiltshire East.							A. H. Wilson
Marlborough B.	D.	A.	—	+	B.1912		
Amesbury R.							
Marlborough R.							
Pewsey R.							
Ramsbury R.							
Yorkshire North Riding (Guisborough).							C. R. Gibson
Guisborough U.	I.	Q.	— C	+	B.1900	1891	
Loftus U.					,,	,,	
Redcar U.					,,	,,	
Saltburn-by-Sea U.					1915	1890	
Skelton and Brotton U.					1914	1891	
Guisborough R.					1900	,,	
Yorkshire West Riding (Including Riccall R.D. in East Riding).							W. B. Hill.
Selby U.	I.	I.M.	—	+	1902	1899	
Goole R.							
Riccall R.							
Selby R.							
Tadcaster R.							
Yorkshire West Riding (Keighley or Craven).							J. E. Atkinson
Haworth U.	I.	A.I.	—	+	1897	1890	
Oakworth U.	S.	A.I.	—	+	,,	,,	
Oxenhope U.	D.	A.I.	—	+	,,	1893	
Silsden U.	S.	A.I.	—	+	1902	1894	
Skipton U.	D.	R.I.	—	+	,,	1890	
Keighley R.	I.	A.I.	—	+	1897	,,	
Sedbergh R.	I.	A.R.	—	+	1912	,,	
Settle R.	I.	A.I.Q.	—	+	1909	,,	
Skipton R.	I.	A.I.Q.	—	+	1902	,,	
WALES.							
Brecon.							
Builth U.		A.	—	—			W. Black-Jones†
Builth R.			—	—			
Colwyn R.							
(ii) *Groups of two or more districts mostly under one whole-time officer.*							
Beds.							
†Leighton Buzzard U.	S.	R.A.I.	—	+	—	1889	P. T. H. Stedman†
†Eaton Bray R.	D.	A.R.	—	+	—	,,	
†Wing R.	D.	A.R.	—	+	1904	,,	
Biggleswade U.	I.	A.	—	+	1879	1892	H. W. Grattan
Biggleswade R.						1891	

† Part-time.

Districts (arranged in alphabetical order of counties).	Answers to questions :— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
Bucks.							
Marlow U.	S.	R.			1892		F. H. P. Wills†
Hambledon R.	S.	A.	—	++	,,	1891	
Wycombe R.	I.	A.I.	—	+	1901	,,	
Cornwall.							
† Ludgvan U.	D.	A.	—	—	—	1890	H. R. Phillips†
† Madron U.							
† Paul U.							
† West Penwith R.							
Cumberland.							
Cockermouth U.	D.	A.	—	—	—	1899	C. A. Mason
Maryport U.	D.	I.M.S.	—	+	—	1890	
Cockermouth R.	I.	M.A.	—	+	1903	1899	
Derby.							
Glossop B.	D.	I.	— C	+	1894	1892	E. H. M. Milligan
Glossop Dale R.	D.	R.A.I.					
Devon.							
Newton Abbot U.	S.	R.A.I.	—	+	1901	1890	H. B. Mapleton
Dawlish U.							
Newton Abbot R.							
Essex.							
Haverhill U. (W. Suffolk)	D.	A.		+	1887	1890	A. Morgan.
Bumpstead R.				—		1892	
Clare R. (W. Suffolk)			— C	—		1892	
Moulton R. ,,			+ A	+	1890	1890	
Newmarket R. (Cambs.)				+	,,	,,	
Romford U.	I.	R.	—	+	1901		A. Ball
Romford R.		A.					
† Grays Thurrock U.	D.	R.	—	+	1893	1890	W. B. Wood
† Tilbury U.							
Saffron Walden B.	D.	R.A.	—	+		1890	S. R. Richardson
Saffron Walden R.							
Gloucestershire							
Nailsworth U.	I.	I.A.R.	—	+	1904	1890	R. Green
Stroud U.							
Stroud R.							
Hunts.							
St. Ives B.	D.	A.	—	+	1912		W. R. Grove†
St. Ives R.							
Swavesey R. (Cambs.)							
St. Neots U.	S.	A.	—	+	1920	1899	E. J. Cross†
Eaton Socon R. (Beds)							
St. Neots R.							

† Part-time.

Districts (arranged in alphabetical order of counties).	Answers to questions:— 3 Trend of population.	4 Character of district.	5 Change in age distribution.	6 If served by hospitals, or not.	7 Hospital isolation of Scarlet fever started.	8 Scarlet fever made notifiable.	Whole-time Medical Officer of Health.
Lancs.							
Fulwood U.	S.	R.A.	—	+	1908	1896	C. J. Trimble
Walton-le-Dale U.	D.	I.A.	—	+	1905	1893	
Preston R.	I.	I.A.	—	+	1907	1890	
Middlesex.							
Ealing B.	I.	R.	—	+	1885	1890	T. Orr
†Hanwell U.	I.	R.	—	+	—	,,	
Somerset.							
† Wellington U.	D.	A.I.	—	+	1914		E. A. B. Poole
† Taunton R.	D.	R.A.			1879		
Staffs.							
Newcastle - under - Lyme B.	I.	R.	—	+	1884	1889	A. White
Wolstanton United U.	I.	M.I.R.	—	+	1887	1904	
Surrey.							
Guildford B.	I.	R.	—	+	1893	1889	R. W. C. Pierce
Woking U.	I.	R.	—	+	,,	1889	
Guildford R.	I.	R.	—	+	1885	1889	
Reigate B.	I.	R.			1893	1890	A. E. Porter
Reigate R.	I.	R.A.		+	1886	1889	
Sussex East.							
Hove B.	I.	R.	+ A	+	1885	1893	A. Griffith
Portslade-by-Sea U.	I.	I.		+	1885	1890	
Steyning East R.	I.	R.A.				1891	
Warwickshire.							
Stratford-on-Avon B.	I.	R.A.	—	+	1894	1890	L. L. Fyfe.
Startford-on-Avon R.	D.	R.A.	—	+	1894	1890	
Worcestershire.							
† Evesham B.	I.	R.	—	+	1886	1900	G. H. Fosbroke
† Evesham R.	I.	A.	—	+	,,	,,	
† Feckenham R.	S.	A.	—	+	1875	,,	
† Pershore R.	D.	A.	—	+	1898	,,	
Yorks West Riding.							
Adwick-le-Street U.	I.	A.M.	+ C	+			A. B. Dunne
Bentley-with-Arksey U.	I.	A.M.	+ C	+			
Doncaster R.	I.	A.M.	+ C	+			
Batley U.	D.	I.	—	+	1905	1891	G. H. Pearce
Heckmondwike U.	S.	I.	—	+	1905	1891	
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Hay U. (Brecon)	D.	A.I.	—	+	1913		T. E. Hincks
Bredwardin R. (Hereford)	D.	A.I.	—	+	1913		
Painscastle R. (Radnor)	D.	A.I.	—	+	1913		

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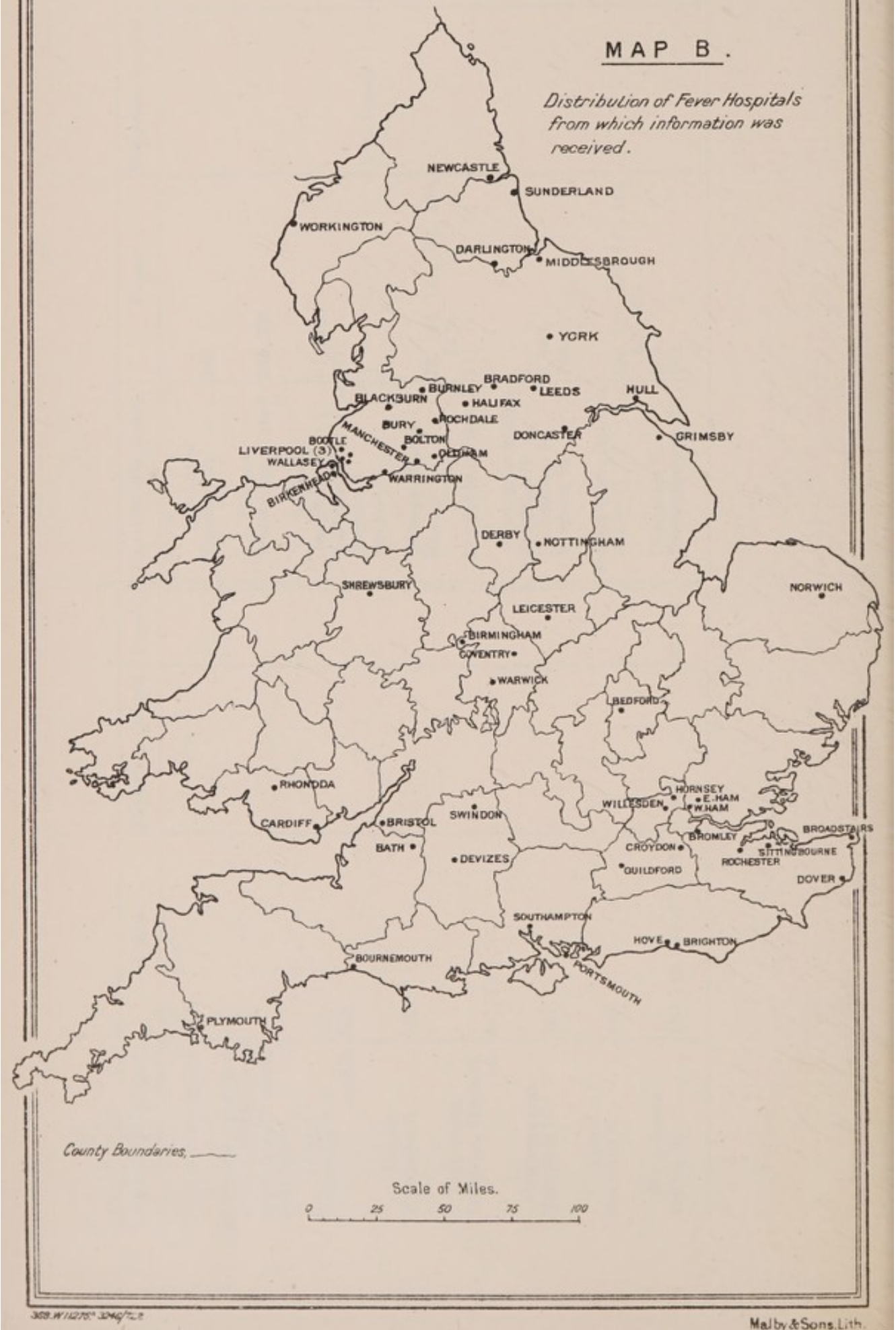
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APPENDIX L

Descriptive list of provincial Fever Hospitals from which information has been received.

Following this Appendix will be found a list which shows respectively the pages of the report on which various hospitals are mentioned and the pages on which the Medical Superintendents of such hospitals have been quoted.

Place	Name of Hospital and Medical Superintendent.	Districts served.	First opened for Scarlet Fever patients	Total no. of beds. (Approx.)	Average percentage of beds set aside for Scarlet Fever.	Scarlet Fever cases actually treated in 1923, shown as a percentage of total no. of admissions.
1. Bath Claverton Down	Statutory Fever H. J. F. Blackett	Bath City Bath R.D.	Oct. 1876	70	—	70·0
2. Bedford London Road	Boro' Isol. Hosp. F. B. W. Phillips	Borough of Bedford	1898	72	50	66·6
3. Birkenhead Tollemarche Rd.	Fever Hosp. D. M. Mathieson	C.B. of Birkenhead	Mar. 1895	72	66	78·0
4. Birmingham Yardley Road, Small Heath	City Hosp. Little Bromwich E. H. R. Harries	City of Birmingham	July 1900	466	50–60	
5. Blackburn Park Lee Road	Corporation Hosp. W. Allen Daley	C.B. of Blackburn and neighbouring urban districts when possible	1895	98	20 (at present)	46·0 (1922)
6. Bolton Deane	Borough Hosp. C. W. Paget Moffatt	C.B. of Bolton	—	120 (Burdett)	—	74·0
7. Bootle Linacre Lane	Infect Dis. Hosp. F. T. H. Wood	Litherland U.D. Bootle C.B.	1886	14	32·4	59·6
8. Bournemouth Gloucester Road, Boscombe	Sanitary Hosp. A. D. Edwards	C.B. of Bournemouth	1886	80	30·0	58·6 (1922)
9. Bradford	City Hosp. J. T. Kitchin	Bradford, except Idle, Eccleshill and Bradford part of North Bierley Union	1887	200	50·0	65·4
10. Brighton Bear Road	Fever Hosp. Duncan Forbes	Brighton C.B. Newhaven R.D.	1881	170	41·1	54·2 (1922)
11. Bristol Ham Green	Ham Green Hosp. B. A. Peters	City and County of Bristol	1899	210 (nominally 130)	40·0	47·0 (1922)
12. Bromley	Bromley and Beckenham Joint Isol. Hosp. P. N. Randall	Bromley, Beckenham, Chislehurst, Sidcup and Bromley R.D.	—	130	64·0	71·2

Place.	Name of Hospital and Medical Superintendent.	Districts served.	First opened for Scarlet Fever patients.	Total no. of beds. (Approx.)	Average percentage of beds set aside for Scarlet Fever.	Scarlet Fever cases actually treated in 1923, shown as a percentage of total no. of admissions.
13. Burnley Marsden Road	Burnley and District Sanatorium. J. M. Ferguson.	Burnley C.B. Burnley R.D. Brierfield U.D. Padsham U.D.	1899	98	53·0	75·0
14. Bury Bolton Road	Florence Nightingale Hosp. J. B. Morton	Bury, Radcliffe, Ramsbottom, Tottington, Whitefield and Bury R.D. By agreement, also Bacup, Haslingden, Rawtenstall, Turton, Accrington, Prestwich	Oct. 1903	88	41·0	69·8
15. Cardiff	Sanatorium R. F. Picken	City and Port of Cardiff	July 1892	208 (incl. of small-pox beds.)	60·0	59·8
16. Coventry Stoney Stanton Road	City Hosp. E. H. Snell	City of Coventry and Coventry R.D., Foleshill R.D. and Nuneaton U. and R. Districts when possible	1874	150 (nominally 106)	88·0	93·2
17. Croydon Waddon Marsh Lane	C. *Borough Isol. Hosp. N. P. Newsholme	Croydon Borough Penge U.D.	1893	170	53·0	61·2 (1922)
18. Darlington Hunden's Lane	Fever Hosp. S. G. Mostyn	Darlington C.B. By agreement, Darlington R.D. and Leyburn R.D. (N.R.) Occasionally other districts	1875	105	—	71·0
19. Derby Smalley Road	Borough Isol. Hosp. A. E. Brindley	Derby C.B.	May 1890	60	33·3	54·0
20. Devizes	Devizes and Pewsey Joint Isol. Hosp.	Devizes U.D. Devizes R.D. Pewsey R.D.	Dec. 1905	22	81·8	—
21. Doncaster	Carr House Hosp. D. L. Anderson	Borough of Doncaster	1895	56	55·3	55·6 (1922)
22. Dover Tower Hamlets	Borough of Dover Isol. Hosp. A. S. Mc Master	Dover Borough and by agreement Dover R.D.	1872	55	34·5	38·2 (1922)

Place.	Name of Hospital and Medical Superintendent.	Districts served.	First opened for Scarlet Fever patients	Total no. of beds. (Approx.)	Average percentage of beds set aside for Scarlet Fever.	Scarlet Fever cases actually treated in 1923, shown as a percentage of total no. of admissions
23. East Ham Roman Road, E.6	Borough Hosp., East Ham W. Benton	East Ham	1895	110	70·0	—
24 Grimsby Scartho	Scartho Isol. Hosp. B.C. Stevens	Grimsby C.B. CleethorpesU.D. Grimsby R.D. Occasionallyalso Brigg U.D. and Louth and Scunthorpe U. and R.D.	1908	56	46·0	44·3
25. Guildford Woodbridge	Guildford, Godalming and Woking Joint Hosp. Bd. R.W.C. Pierce	Guildford B. Guildford R.D. Godalming B. Woking U.D. Occasionally also Hambledon R.D.	1885 as a R.D. H., 1893 as a Jt. H.	72	61·0	69·0
26. Halifax Stoney Royd	Halifax Corporation Fever Hosp. C. Banks	Halifax C.B. When possible, also Stainland, Greetland, Elland, Southowram, Queensbury, Shelf, and Luddenden Foot U.D.	1873	72	44·4	—
27. Hornsey Coppetts Road, N. 10	Hornsey, Finchley and Wood Green Jt. Hosp. Committee J. R. Prior	Hornsey, Finchley, Wood Green	1886	110	60·0	54·0
28. Hove Portslade	Borough San. A. Griffith	Hove Borough, Portslade U.D., Steyning East R.D., Steyning West R.D., Southwick R.D. Occasionally Horsham U. and R. Districts and Shoreham U.D.	1885	63	50·0	93·0 (1922)
29. Hull Hedon Road	City Hosp. I. N. Mason	City of Hull	May 24 1887	120	35·0	372·

Place.	Name of Hospital and Medical Superintendent.	Districts served.	First opened for Scarlet Fever patients.	Total no. of beds. (Approx.)	Average percentage of beds set aside for Scarlet Fever.	Scarlet Fever cases actually treated in 1923, shown as a percentage of total no. of admissions.
30. Leeds Seacroft	City Hospitals, Seacroft A. C. Pearson	Leeds Borough	Beckett Street 1885, Seacroft Hosp. 1904. (Original "House of Recovery" established 1804)	500	60·0	74·2
31. Leicester Groby Road	City of Leicester Isol. Hosp. C. Killick Millard	City of Leicester. Very occasionally outside districts	1900	110	61·8	74·0 (1922)
32. Liverpool Fazakerley	Fazakerley Isol. Hosp. C. Rundle	City of Liverpool	1906	460	43·2	29·5 (1922)
33. Liverpool	City Hosp. North E. R. Pierce	Do.	—	166	88·0	100·0 (1922)
34. Liverpool	City Hosp. South R. Henry	Do.	1888	100	50·0	48·9 (1922-1923)
35. Manchester Newton Heath	Monsall Fever Hosp. D. S. Sutherland	City of Manchester and the Bucklow Jt. Hosp. Board's districts	1871	650	No fixed proportion	65·5 (1922)
36. Middlesbrough West Lane	Corporation Fever Hosp.	Middlesbrough C.B., Thornaby Borough. Middlesbrough and Stokesley R. Districts. The Tees Port Sanitary District	1877	170	38·8	75·6 (1922)
37. Newcastle Walker Gate	City Hosp. for Inf. Diseases H. Kerr	Newcastle-upon-Tyne	1888	295	40·0	54·2 (1922)
38. Norwich	Norwich Isol. Hosp. H. C. Pattin	City of Norwich	1893	88 up to 112	45·4	59·4 (1922)
39. Nottingham Bagthorpe, Basford	City Isol. Hosp. P. Boobbyer	City of Nottingham. Other districts occasionally by special arrangement	1891	200 (*circa*)	35·0 (*circa*)	50·0

Place.	Name of Hospital and Medical Superintendent.	Districts served.	First opened for Scarlet Fever patients.	Total no. of beds. (Approx.)	Average percentage of beds set aside for Scarlet Fever.	Scarlet Fever cases actually treated in 1933, shown as a percentage of total no. of admissions.
40. Oldham	Westhulme Hosp. J. B. Wilkinson	Oldham C.B. By arrangement, also Chadderton, Royton, Crompton, Lees and Failsworth	Original h. 1875. Present h. 1898	130	52·0	—
41. Plymouth Mount Gold	Borough Hosp. Mount Gold Octavius Hall	Plymouth	1890	80	46·0	58·8
42. Portsmouth	Milton Inf. Diseases Hosp. A. M. Fraser	Portsmouth	1884	265	44·9	63·2
43. Rhonnda Ystrad	Tyntyla Isol. Hosp. J. D. Jenkins	Rhondda U.D.	June 25 1909	80	45·0	72·0
44. Rochdale Bolton Road	Marland Hosp. A. G. Anderson	Rochdale C.B., Heywood, Middleton	1886	120	42·0	80·2
45. Rochester	St. Williams Hosp. S. Pritchett	Rochester, Chatham, Port of Rochester	Jan. 1883	84	40·0	63·0
46 St. Helens	Isol. Hosp. F. Hauxwell	St. Helens C.B., Haydock U.D.	1882	136	26·0	51·4
47. Shrewsbury	Shrewsbury and Atcham Jt. Isol. Hosp. H. G. Smith	Borough of Shrewsbury, Atcham R.D.	1910	29	69·0	64·7 (1922)
48. Sittingbourne	Sittingbourne and Milton Fever Hosp. H. H. Fisher	Sittingbourne, Milton, Isle of Sheppey	1878 (*circa*)	68–86	33·0 (*circà*)	50·8
49. Southampton Millbrook	Isol. Hosp. R. E. Lauder	Southampton C.B., Port of Southampton, New Forest R.D., and occasionally from other Rural Districts	Feb. 1900	136	36·0	38·8
50. Sunderland Hylton Road Ford	R.D. Isol. Hosp. G. W. Scott	Bishopswearmouth Without, Ford, Fulwell, Hylton, Ryhope, Tunstall	April 1907	42	16·0	85·8
51. Swindon	Swindon and District Isol. Hosp. D. Brewer	Swindon, Highworth, Ramsbury and an increasing number of districts in North Wilts	1889	172	50·0	86·6 (1922)

Place.	Name of Hospital and Medical Superintendent.	Districts served.	First opened for Scarlet Fever patients.	Total No. of beds. (Approx.)	Average percentage of beds set aside for Scarlet Fever.	Scarlet Fever cases actually treated in 1923, shown as a percentage of total no. of admissions.
52. Thanet Haine, near Ramsgate	Thanet Isol. Hosp. J. C. Durston	Margate, Broadstairs and St. Peters, Ramsgate R.D.	1902	98	67·3	67·0
53. Wallasey Mill Lane	Corporation Inf. Diseases Hosp. T. W. Naylor Barlow	Wallasey C.B.	Oct. 28 1887	114	52·6	28·7
54. Warrington	County Borough of Warrington Isol. Hosp. G. W. N. Joseph	Warrington C.B. WarringtonR.D.	May 28 1877	123		
55. Warwick Heathcote	Heathcote Isol. Hosp. W. L. Goldie	Borough of Royal Leamington Spa, Borough of Warwick, Kenilworth U.D., Warwick R.D.	1888	83	59·0	65·0
56. West Ham Plaistow	Plaistow Hosp. D. MacIntyre	West Ham C.B.	1896	200	47·0	34·0
57. Willesden Neasden, N.W. 10	Municipal Hosp. W. J. J. Stewart	Willesden U.D.	1892	122	60·0	27·1
58. Workington	Ellerbeck Hosp. R. W. Macpherson	Workington B.	1902	40	50·0	54·0
59. York Yearsley Bridge	York City Fever Hosp. E. M. Smith	City of York, Flaxton R.D.	1881	79	25·3 (*circa*)	75·5

Reference list of Hospitals mentioned and Reporters quoted in the text of the Report.

Hospitals.	Pages.	Reporters.	Pages.
Bedford Borough Isol. Hosp.	49, 78, 81, 101, 108, 226		
Birkenhead Fever Hosp.	23, 65, 73, 86, 89, 90, 92, 93	D. M. Mathieson	82.
Birmingham City Hosp., Little Bromwich	21, 64, 65, 66, 68, 76, 104, 105, 193, 207, 220	E. H. R. Harries	61, 63, 66, 72 76, 104, 144, 208.
Blackburn Corporation Hosp.	49, 64, 78, 81, 100, 101, 110, 226		
Bootle Infect. Dis. Hosp.	76, 328	F. T. H. Wood ...	48.
Bournemouth Sanitary Hosp.	65, 81, 82	A. D. Edwards ...	61, 82.
Bradford City Hosp.	65, 78, 79, 80, 82, 83, 98, 110	J. T. Kitchin ...	83.
Brighton Fever Hosp.	64, 78, 99, 100, 101 ...	Duncan Forbes ...	61.
Bristol, Ham Green Hosp.	21, 23, 66, 68, 69, 70, 73, 74, 78, 81, 82, 86, 89, 90, 91, 92, 93, 94, 95, 100, 101, 108, 206, 220	B. A. Peters ...	61, 69, 71,72, 74,83.
Bromley and Beckenham Joint Isol. Hosp.	65, 101, 108, 111.		
Burnley and District San.	64.		
Bury, Florence Nightingale Hosp.	21, 67, 68, 99.		
Cardiff Sanatorium ...	23, 81, 86, 90, 91, 92, 93, 94	R. F. Picken ...	88.
Coventry City Hosp.	68, 72, 100	E. H. Snell ...	61.
Croydon C. Borough Isol. Hosp.	65, 100, 110	N. P. Newsholme	62.
Darlington Fever Hosp.	21, 76, 80, 81.		
Derby Borough Isol. Hosp.	64, 68, 78, 80, 82, 101	A. E. Brindley ...	83.
Devizes and Pewsey Joint Isol. Hosp.	78.		
Doncaster, Carr House Hosp.	78, 81, 101, 108.		
East Ham Borough Hosp.	65, 72.		
Grimsby, Scartho Isol. Hosp.	76, 80, 82.		
Guildford Joint Hosp. Board	61, 64, 100.		
Hornsey Joint Hosp. Committee	21, 23, 68, 80, 82, 100...	J. R. Prior ...	62, 63, 72,83, 98.
Hove Borough San....	100.		
Hull City Hosp. ...	65, 81	I. N. Mason ...	63.
Leeds City Hosps. Seacroft	21, 64, 65, 68, 76, 80, 81		
Leicester Isol. Hosp.	100, 101, 214.		
Liverpool, Fazakerley Isol. Hosp.	21, 23, 67, 69, 72, 89, 90, 91, 92, 93, 94, 100, 102, 108, 110, 204	C. Rundle ...	62, 66, 68.

Hospitals.	Pages.	Reporters.	Pages.
Liverpool, City Hosp. North	64, 78, 81.		
Liverpool, City Hosp. South	64, 102.		
Manchester, Monsall Fever Hosp.	21, 23, 68, 72, 78, 81, 89, 90, 91, 92, 93, 94, 101, 108, 109, 210	D. S. Sutherland	62.
Middlesbrough Corporation Fever Hosp.	21, 108.		
Newcastle City Hosp. for Inf. Diseases	21, 23, 64, 65, 68, 73, 75, 78, 81, 82, 86, 89, 90, 92, 100, 101, 104, 193, 207, 220, 250	H. Kerr	62, 73, 104
Norwich Isol. Hosp....	21, 49, 65, 78, 81, 82, 100, 101, 226		
Nottingham City Isol. Hosp.	21, 23, 64, 65, 68, 73, 75, 80, 81, 205	P. Boobbyer ...	72, 74, 76, 112.
Oldham, Westhulme Hosp.	80, 110.		
Plymouth Borough Hosp.	21, 81, 108	Octavius Hall ...	106.
Portsmouth, Milton Inf. Diseases Hosp.	65, 73, 78.		
Rhondda, Tyntyla Isol. Hosp.	68, 81	J. D. Jenkins ...	110.
Rochdale, Marland Hosp.	65, 68, 100, 108.		
Rochester, St. Williams Hosp.	81, 99.		
St. Helens Isol. Hosp.	23, 80, 82, 86, 89, 90, 91, 92, 93, 94, 111	F. Hauxwell ...	83, 88.
Salford, Ladywell San.	79, 108, 109, 210.		
Shrewsbury and Atcham Jt. Isol. Hosp.	81, 100.		
Sittingbourne and Milton Fever Hosp.	110.		
Southampton Isol. Hosp.	64, 65, 78, 81, 82, 100, 108		
Sunderland R.D. Isol. Hosp.	76, 80.		
Swindon and District Isol. Hosp.	21, 23, 68, 71, 73, 86, 89, 90, 91, 92, 93, 94	D. Brewer ...	62, 71, 72,73, 88, 104.
Thanet Isol. Hosp. ...	65, 80.		
Wallasey Corporation Inf. Diseases Hosp.	23, 82, 86, 89, 90, 92, 93, 94, 100	T. W. Naylor Barlow	84, 88, 92, 106.
Warrington C.Borough Isol. Hosp.	65, 81, 100.		
West Ham, Plaistow Hosp.	21, 23, 65, 68, 71, 72, 81, 86, 89, 90, 91, 92, 93, 94, 110, 325	D. MacIntyre ...	71.
Willesden Municipal Hosp.	21, 65, 72, 77, 81, 99, 100, 104, 106, 108, 109, 111, 193	(The late) W. J. J. Stewart	62, 63, 72,77, 105, 106.
Workington, Ellerbeck Hosp.	80, 81, 82	R. W. Macpherson	84.

APPENDIX M

List of places in the British Isles where the Milne treatment and other inunction methods have been, or are being, adopted, with notes concerning the measures employed and the results obtained.

N.B.—*The first portion of the list, comprising entries* 1 *to* 35, *was compiled from the results of a previous investigation and the order followed is a chronological one; to this first portion has been added further information derived from the answers sent in on the questionnaire forms and entries* 36 *to* 143 *are arranged according to counties. Districts in italics are those in which, as far as can be estimated, Milne methods are at present in use either as a normal policy or on special occasions. An asterisk against items in Column* 6 *indicates that the inunction method described is probably only carried out at the end of the illness to check dissemination of scales. The phrase "last* 10 *years" (in Column* 8) *refers to the period* 1914 *to* 1923.

Serial No. (1)	Period of experiment or practice. (2)	Locality. (3)	Name and office of experimenter or reporter. (4)	Number and circumstances of cases treated. (5)	Methods of treatment employed. (6)	Results of treatment as recorded by those who adopted it. (7)	Remarks. (8)
1	1870 and onwards	London	Dr. Lankester Coroner for Middlesex	Private patients as a matter of routine practice	Inunction with carbolic oil	Apparently favourable	Practice cited and followed by Dr. Bezly Thorne (Bibl. No. 149).
2	1880–1910 circ.	Bacup, Lancs. ..	Dr. J. P. Brown, M.O.H.	No details	Carbolic oil inunction with the burning of sulphur	Favourable	——
3	1880–?	London. Dr. Barnardo's Homes, Ilford	Dr. Robert Milne, M.O. to Dr. Barnardo's Homes	No consecutive details	Carbolic oil inunction and then "Oleusaban"	Not altogether satisfactory	Methods discarded in favour of eucalyptus inunction.
4	1887–91 circ.	Edinburgh ..	Dr. W. Allan Jamieson, Consulting Phys. Edin. City Hospital	*All hospital patients* as a routine method	Inunction morning and evening, with ointments of Ac. Carbol. and Thymol; frequent painting of throat with glycerine and borax; nightly warm baths	Considered that early infection through the throat, and late infection by the skin, were thus avoided. Separation of cases unnecessary and home treatment made possible	(Bibl. Nos. 146 and 158).

Serial No. (1)	Period of experiment or practice. (2)	Locality. (3)	Name and office of experimenter or reporter. (4)	Number and circumstances of cases treated. (5)	Methods of treatment employed. (6)	Results of treatment as recorded by those who adopted it. (7)	Remarks. (8)
5	1889–93 circ.	Teddington ..	Dr. J. Brendon Curgenven, General Practitioner	26 patients in private practice	Inunction with a proprietary preparation containing eucalyptus with thymol, camphors and aromatics. Inunction night and morning and sprinkling of floors and bedclothes with the oil	The mixture said to have both a constitutional as well as a local effect. Early treatment arrested the disease, disinfected the patient, obviated the isolation of patient and the quarantine of contacts, lightened the sequelæ and reduced mortality. Saved expense	Claims were generally thought to be extravagant. The method had some adherents, notably Dr. Priestley (Bibl. No. 148).
6	1890 circ.	Wimbledon ..	Dr. Edward Little, General Practitioner	Cases *in hospital* and private practice	"Eucalyptus treatment"	Desquamation hastened; no return cases. Infectives and susceptibles may be mixed	Quoted by Dr. Priestley (Bibl. No. 161).
7	1892	Western Fever Hospital, London	Dr. R. M. Bruce, Medical Superintendent	16 patients *in hospital*	Patient rubbed from head to foot three times a day for a fortnight with eucalyptus oil	Unsatisfactory	Abandoned.
8	1893	Shepherd's Bush, London	Dr. S. Peake, General Practitioner	20 cases in private practice	Those of Curgenven (*See* No. 5)	The "treatment averted the disease;" it did not however, prevent suppurative complications in all cases	(Bibl. No. 160).

9	1893 circ.	Enfield	Dr. J. J. Ridge, M.O.H.	No details	That of Curgenven (*See* No. 5)	"We have used eucalyptus but without any evidence of the value said to attach to the treatment." Also "I have had several illustrations of the failure of inunction to prevent infection"	(Bibl. No. 156).
10	1893 circ.	Chelmsford ..	Dr. J. C. Thresh, M.O.H.	No details	That of Curgenven (*See* No. 5)	"The eucalyptus repeatedly failed to prevent the spread of scarlet fever"	(Bibl. No. 154).
11	1894	Leicester ..	Dr. J. P. Priestley, M.O.H.	120 *hospital patients* chosen alternatively and compared with a similar number treated on usual lines. All the cases were mild ones at the decline of an epidemic	Inunctions thrice daily for three days with "Tucker's Olousaban 'A' disinfectant"; then once a day for a week after a warm bath. Same disinfectant sprayed into throat, nose and mouth and diffused into the air of the room. No internal administration of eucalyptus	A lower death rate. A shorter stay in hospital. Slightly fewer cases with serious complications. Fewer return cases. Freer and quicker desquamation	Not continued under Dr. Millard (Bibl. No. 161).
12	1898–1908	Monifieth Burgh, Forfar	Dr. W. Gorrie, M.O.H.	No details	*Eucalyptus, 1 in 3 of olive oil	Used "for the disinfection and prevention of skin dust"	(Bibl. No. 164)

Serial No. (1)	Period of experiment or practice (2)	Locality. (3)	Name and office of experimenter or reporter. (4)	Number and circumstances of cases treated. (5)	Methods of treatment employed (6)	Results of treatment as recorded by those who adopted it (7)	Remarks (8)
13 (*a*)	1902–1919	Girls' Village Home (Dr. Barnardo), Barkingside, London	Dr. Robert Milne, P.M.O.	268 cases occurring in the "village." These were treated at first in special cottages, and from 1910 in a modern hospital (3 wards of 20 beds and six single-bed-wards). During the 1904–5 epidemic careful isolation of infected children was adopted, on all other occasions, however, no isolation or quarantine was practised	Thorough inunction of whole body with eucalyptus oil twice a day for first 4 days; then once a day until the 10th day. Swabbing of tonsils every 2 hours for 24 hours with carbolic oil, 1 in 10	Dr. Milne had implicit faith in this treatment and considered that it prevented return cases, obviated cross-infections and reduced complications to a negligible figure	The method was adopted in several places at home and abroad, but on the whole with disappointing results. A revival of interest in the treatment has taken place during last three years. In Sept. 1923, Dr. Gushue-Taylor, Dr. Milne's successor, condemned the method (Bibl. No. 163).
(*b*)	1920	Ditto	Dr. Gushue-Taylor, P.M.O.	50 cases as above (*i.e.*, no isolation). *Short stay in hospital*	Milne Treatment (as above) *in toto*	Dr. Gushue-Taylor dissatisfied with results	*See* Bibl. No. 206.
(*c*)	Mar. 31, 1921, to Apr. 1, 1922	Ditto	Ditto	124 cases as above (*i.e.*, no isolation) *short stay in hospital*	Milne method *in toto* ..	Dr. Gushue-Taylor dissatisfied. Infecting rate = 18·5	Ditto.
(*d*)	Apr. 1, 1922, to Mar. 31, 1923	Ditto	Ditto	27 cases, each *isolated* for an average of 54 days	Eucalyptus oil and carbolic oil as before	Dr. Gushue-Taylor considered that the isolation of cases and the prolonged stay in hospital kept down the incidence and the return-case rate. Infecting rate = 3·7	Ditto.

14	Previous to 1906	Brentwood Infant School of Hackney Workhouse, at Brentwood	Dr. S. Frazer, M.O.H. and M.O. to Workhouse	No details of cases treated	Milne treatment ..	"Since adopting your method I have never had any trouble. We use the treatment and allow the children to be together." (Extract from letter to Dr. Milne)	The institution was later converted into an epileptic colony and the method gained no adherents among the practitioners in the district.
15	Mar., 1909	South Eastern Fever Hospital, London	Dr. F. M. Turner, Medical Superintendent	180 patients, including certain doubtful cases, *in a general ward*	Milne treatment ..	Treatment failed to prevent spread of infection, cross-infection and occurrence of return cases	Abandoned (Bibl. No. 181).
16	1909 circ.	Plaistow Fever Hospital, London	Dr. Biernacki, Medical Superintendent	All infectious cases *admitted to hospital;* 700 proved and doubtful cases of scarlet fever in the scarlet fever wards	Milne treatment ..	"An increase in complicated cases and the return-case rate rose above the average"	Abandoned.
17	1908–9	Dunfermline, Fife	Dr. J. Dalgliesh, M.O.H.	13 cases in practice ..	Milne treatment — except that formamint tablets replaced the carbolic oil	"Case was hastened through inhalation of vapour"	(Bibl. No. 170).
18	1909–10	South Gloucestershire Combined Districts	Dr. F. T. Bond, M.O.H.	No figures given. Treatment adopted wherever general practitioners were amenable. Nurse at work in Chipping Sodbury District	Milne treatment ..	Dr. Bond considered that it was a satisfactory method for some parts of his district	Method abandoned by Dr. Bond's successor in 1911. Some general practitioners in the district continued the use of eucalyptus (Bibl. No. 171).
19	June, 1909 to Feb., 1910	Cambridge ..	Dr. A. J. Laird, M.O.H.	100 consecutive cases *admitted to hospital*	Milne treatment except that the throat toilet was extended to 10 days	Results unsatisfactory	Abandoned (Bibl. No. 182).
20	1909 ?	Renfrewshire County	Dr. A. C. Monro, M.O.H.	184 cases	Milne treatment ..	Does not prevent return cases nor prevent complications	Apparently abandoned.

Serial No. (1)	Period of experiment or practice. (2)	Locality. (3)	Name and office of experimenter or reporter. (4)	Number and circumstances of cases treated. (5)	Methods of treatment employed. (6)	Results of treatment as recorded by those who adopted it. (7)	Remarks. (8)
21	1909–23	*Clydebank Burgh, Dumbarton*	Dr. T. M. Strang, M.O.H.	Half the cases occurring in the Burgh; patients treated at home. Whole-time nurse employed	Milne treatment ..	"In the present mild type of scarlet fever I consider it a very good way of treatment, and we are quite pleased with its working here."	In present use (Bibl. No. 187*a*).
22	July, 1909–23	*Dukinfield, Cheshire*	Dr. J. R. S. Park, M.O.H.	All cases treated at home, but no special nurse employed	Milne treatment ..	"I am so satisfied with the results of this treatment during the past 13 years that I recommend its continuance"	In present use (Bibl. No. 174).
23	1910	*Audenshaw, Lancs.*	Dr. W. R. Judd, M.O.H.	"Hundreds" of cases during 25 years. Experience relates to home - treated cases only	Milne treatment as regards the skin; Lysol for the throat. Had used carbolic oil for the skin before Milne's advocacy of eucalyptus oil. No special nurse employed	Have adopted the method "with surprising and very gratifying results." Contacts are prevented from being infected. Inunction soothes patient; skin irritation is allayed and sleep induced. Where treatment is begun early secondary cases are very rare; sequelæ have been very uncommon. Results not so good since scarlet fever became mild, as cases are missed	In present use.

24	1911–12–13	*Leith, Scotland* ..	Dr. W. Robertson M.O.H.	(*a*) *Hospital cases* ..	Milne treatment ..	Complications not avoided; length of stay not decreased more by this method than by others	Dr. Robertson as M.O.H., Edinburgh, issued a circular to the medical men in Edinburgh early in 1925 advocating a reduction in the number of scarlet fever cases sent to hospital. He referred to the success of the Milne treatment at Leith, particularly in regard to 200 consecutive cases occurring chiefly in workmen's homes (Bibl. No. 187*f*).
				(*b*) 100 cases treated at home	Ditto	Certainly there is something to be said for the method which can show such practical results as have been conclusively proved in Leith. Saving of £1,000 on the home-treated cases	
25	1911–12	Nuneaton ..	Dr. V. G. Maitland ..	No details	Milne treatment *in toto*	A financial saving said to have resulted	Abandoned by Dr. Maitland's successors (Bibl. Nos. 187 (*b*) and 189).
26	May 28, 1911, to Mar. 19, 1912	Hove	Dr. A. Griffith, M.O.H.	43 cases (10 adults and 33 children) treated in hospital	Milne treatment, but with longer periods of application	In hospital the supposed effect of eucalyptus was destroyed by the presence of highly infectious cases with severe attacks and sometimes with nasal discharges. Treatment has no effect in preventing complications, or return cases	Abandoned.
27	1912–23	*Forfar Burgh, Scotland*	Dr. G. Peterkin, M.O.H.	76 cases in 1922 ..	Modified Milne method. Ac. boric instead of carbolic oil. Inhalation of eucalyptus for first few days. Nurse for 10 days	A modified Milne treatment at home was exceedingly satisfactory eleven years ago and continues so since. Very few complications	"We have had no reason to alter our opinion."

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28 (*a*)	1913–15	*Wealdstone U.D. Middlesex*	Dr. G. H. Butler, M.O.H.	220 cases, all treated at home	Modified Milne method. Inunctions twice daily for first 2 or 3 weeks. Patients strictly isolated and rooms disinfected	1915. Results still satisfactory	Continued by his successor (Bibl. No. 183).
(*b*)	Oct., 1921–1923	Ditto	Dr. R. P. Bluett, M.O.H.	All such cases as are selected for home-treatment	Patient isolated, utensils disinfected. Inunction for a week by special nurses. "Special fever oil" being used. Contacts quarantined for a week	Cases are singularly free from complications. "I am quite convinced the treatment is sound and economical"	In present use (Bibl. No. 200).
29	1913 circ.	Linacre Hospital, Bootle	Dr. W. Allen Daley, Medical Superintendent	20 cases *in hospital* ..	"Full eucalyptus treatment of the skin and the carbolic treatment of the tonsils"	"So far as cases admitted to a town hospital were concerned, the treatment was of no avail"	Abandoned.
30	1913 circ.	Wallasey ..	Dr. Naylor Barlow, M.O.H.	Tried for 4 years ..	Milne treatment ..	No decrease in number of return cases, cross-infections or complications	Abandoned.
31	1914	*Denton, Lancs.* ..	Dr. W. Stewart, M.O.H.	525 home - treated patients over a period of 8½ years. Home disinfection practised	Milne treatment, but with isolation of patient. No special nurse for the purpose	Does not claim that incidence has been diminished. Return cases rare as compared with hospital experiences. Complications fewer	"The result has been sufficiently satisfactory to recommend the continuance of the system."

32	Oct. 11, to Nov. 4, 1922	Heston and Isleworth U.D., Middlesex	Dr. E. H. T. Nash, M.O.H.	10 cases at home ..	"Milne method to the letter"; nurse lent by Dr. Kirkhope	"The results, which were satisfactory, fully justified the temporary adoption of the method"	Reversion to hospital treatment because beds, for which the L.A. paid in any case, again became available (Bibl. No. 204).
33	1922	Horsham U.D. ..	Dr. S. Child, M.O.H.	Mild cases of an epidemic which were treated at home	Milne method, modified according to Dr. Kirkhope (*See* No. 35)	"System appeared to be of value and there was a significant drop in the spread of cases in affected houses"	Brought to an abrupt end by the death of a nurse. Despite the contretemps regarding the nurse, Dr. Child is quite prepared to recommend the treatment again (Bibl. No. 201).
34	Since May, 1922	*Southgate, Middlesex*	Dr. A. S. Ransome, M.O.H.	100 patients *admitted to hospital* during period May, 1922, to December, 1923, and compared with another 100 cases treated between January and May, 1922, by usual methods	"The Milne method" ..	"On the whole the results appear to be encouraging and justify the continuance of the method for a further period"	Dr. Ransome considers that the Milne method greatly reduces the average length of stay in hospital and diminishes the risk of complications. He found, however, that the return case-rate was higher than that obtained in the control series of cases. *See* Ann. Report for 1923, p. 14.

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35	Apr. 3, to Dec. 31, 1922	*Tottenham M.B.*	Dr. D. Kirkhope, M.O.H.	608 patients treated at home as a matter of routine ; exceptions were made in the case of a pending or past confinement, serious illness, and in cases complicated with diphtheria	The Milne method modified in this way. The throat is swabbed three times a day with 10 per cent. carbolic oil and disinfecting lozenges are sucked between whiles. "Some measure of isolation ought to be employed, at least for 3 or 4 days, and longer if there are any mucous or purulent discharges." Special nurses are employed	(*a*) "It cannot be contended that, as applied at home, the Milne treatment fulfils all the claims made for it." (*b*) "The Milne treatment is a useful adjunct to hospital provision, but it cannot take the place of institutional treatment in complicated or otherwise severe cases" (*See* Ann. Rep., 1922)	In present use (Bibl. Nos. 203 and 207).
		London—					
36	—	*Lambeth M.B.*	Dr. J. Priestley, M.O.H.	On rare occasions ..	"Eucalyptus oil treatment"	"With apparently satisfactory results"	*See* No. 11.
37	—	*Westminster City*	Dr. F. J. Allan, M.O.H.	Limited number of cases during epidemic periods	"Inunctions of antiseptic oils and special attention to the throat and nose"	"With satisfactory results"	(Bibl. No. 205).
		Bucks.—	Dr. T. G. Parrott, M.O.H.	Home-treated cases	"Inunction with eucalyptus oil where possible." Strict isolation	——	One-fourth home-treated in last 10 years.
38	—	*Aylesbury B.*					
39	—	*Buckingham U.*	Dr. T. G. Pemberton, M.O.H.	All home cases ..	External application of eucalyptus oil all over the body is advocated	Lessens spread of infection	Twenty out of 60 home-treated in last 10 years.

40	—	*Chepping Wycombe U.*	Dr. G. D. K. Bannerman, M.O.H.	Home-treated cases	Inunction with carbolic oil where possible, full isolation	—	In 1921, 44 out of 155 cases were home-treated.
		Bucks.—					
41	—	*Buckingham R.*	Dr. P. L. Benson, M.O.H.	Cases home-treated until 1921, since when most cases have been sent to hospital	"Monkey brand" soap and annointing with eucalyptus oil. Strict isolation	Good results	—
		Cambridge—					
24	—	*Caxton and Arrington U.*	Dr. J. H. Dudley, M.O.H.	"In some cases" ..	Thorough inunction with eucalyptus and olive oils. Isolation "as far as possible"	—	Most cases home-treated.
		Cheshire—					
43	—	*Stockport C.B.*	Dr. A. G. Jenner, M.O.H.	Home cases, during peeling stage	*Rubbing body all over with carbolic oil. Printed instructions issued	—	—
44	—	*Ashton-on-Mersey U*	Dr. W. Scott, M.O.H.	Home cases	Body to be rubbed all over with oil or disinfectant from 4th day of illness, followed by disinfectant baths. Printed instructions issued	—	90 per cent. are home-treated.
45	—	*Bredbury and Romiley U.*	Dr. F. Cant, M.O.H.	Most cases home-treated. Local practitioners advised to carry out methods in Col. 6	Advise inunction of carbolic oil, 1 in 10, from the earliest and supply local practitioners free. Mouth washes and gargles also advised. Strict isolation	—	—
46	—	Marple U.	Dr. J. Jackson, M.O.H.	Home-treated cases	*Eucalyptus oil rubbed on whole of body. Case isolated	—	Fifty-four cases notified in 8 years. 30 home-treated.

Serial No.	Period of experiment or practice.	Locality.	Name and office of experimenter or reporter.	Number and circumstances of cases treated.	Methods of treatment employed.	Results of treatment as recorded by those who adopted it.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
47	—	*Winsford U.*	Dr. L. J. Picton, M.O.H.	Cases treated at home	"Eucalyptus oil for inunction of patients and contacts is supplied, and the use of potassium permanganate collutoria advised in a circular." Strict isolation	Experience inconclusive	——
48	—	*Yeardsley - cum - Whaley U.*	Dr. F. G. Allan, M.O.H.	Home cases	Eucalyptus oil treatment	——	——
49	—	Macclesfield R.	Dr. R. Proudfoot, M.O.H.	Tried to a slight extent	Eucalyptus and olive oil inunction	No observable favourable results	——
		Cumberland—					
50	—	*Wigton U.*	Dr. J. A. Gordon, M.O.H.	Home-treated patients	Daily inunction with eucalyptus and olive oil in equal parts for first two weeks. Isolation	Not a guarantee against other members of family contracting scarlet fever	Forty-three cases notified and home-treated in last 10 years.
		Derby—					
51	—	*Glossop B.*	Dr. E. H. M. Milligan, M.O.H.	——	Patient's body rubbed with eucalyptus oil, under the instructions of the medical attendant. Printed instructions issued	——	In Borough 50 per cent. are home-treated; in the R.D. 75 per cent.
52	Since 1922	*Ilkeston U.*	Dr. R. de V. King, M.O.H.	Local practitioners asked to employ Milne's method.* Until 1922 nearly all cases sent to hospital	Eucalyptus oil inunction and swabbing of throat with 10 per cent. carbolic oil for at least 10 days	——	*This advice is not often carried out. 37 per cent. home-treated in last two years.

		Devon—					
53	—	*Honiton U.*	Dr. D. Steele-Perkins, M.O.H.	——	Eucalyptus oil treatment	Excellent results. Shortens attack and prevents spread of infection	——
54	—	*Okehampton B. and R.*	Dr. E. H. Young, M.O.H.	Tried for two years	Inunction of eucalyptus and olive oil. Isolation	"I do not think there was any special advantage"	All cases home-treated; 190 cases notified during 1912–21.
55	—	*Torquay B.*	Dr. T. Dunlop, M.O.H.	Home-treated cases	*No special treatment, but parents of working classes are supplied free of charge with eucalyptus oil, olive oil and liquor potassa to be applied regularly to the body while desquamating	——	Few cases home-treated.
56	—	Plympton St. Mary R.	Dr. S. R. Scott, M.O.H.	Home-treated cases	*Carbolic oil inunction as soon as peeling commences. Strict isolation	Generally with good results. Number of cases that have developed among contacts is small	All except one out of 423 cases home-treated in last 10 years.
57	—	Totnes R.	Dr. S. C. Jellicoe, M.O.H.	——	*After bathing, body smeared with camphorated oil or eucalyptus ointment. Printed instructions issued	——	Cases are considered infectious during peeling stage.
		Dorset—					
58	—	Wimborne U.	Dr. W. Auld, M.O.H.	——	*Carbolic oil applied when desquamating. Isolation in one room	No return cases ..	Nineteen out of 21 cases home-treated in last 10 years.
59	—	*Poole R.*	Dr. W. T. G. Robinson, M.O.H.	——	Modified Milne method, isolation practised	Successful	Only nine out of 113 cases home-treated in last 10 years.
		Durham—					
60	—	Darlington C.B.	Dr. S. G. Mostyn ..	Tried *in one ward* for a considerable time	Eucalyptus and carbolic oil treatment	Discontinued as proportion of cases with complications was not diminished	——

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61	—	Gateshead C.B.	Dr. T. M. Clayton, M.O.H.	Some home-treated patients	Eucalyptus oil advised by some medical men	"I have not noticed any difference as regards the final issue, whether it is used or not"	Between 30 and 50 per cent. of cases home-treated in last 10 years. On an average 413 cases notified per year for last 10 years.
62	Prior to 1906	Whickham U. ..	Dr. A. Smith, M.O.H.	When there was no hospital	Patient rubbed with carbolised oil, latterly changed to eucalyptus oil. Strict isolation	Most satisfactory results	No special home-treatment lately because not required.
		Essex—					
See No. 13	—	Ilford U. ..	Dr. A. H. G. Burton M.O.H.	Exhaustive trial in Barnardo's Institution	Milne treatment ..	Now substituted by hospital isolation	*See* No. 13 (*b*). (Bibl. No. 207.)
		Gloucester—					
63	—	*Northleach R.* ..	Dr. E. J. Ryan-MacMahon	Home-treated cases	10 per cent. eucalyptus oil and olive oil. Formerly 5 per cent. carbolised oil. Isolation	Satisfactory where orders were obeyed	Twenty-three out of 142 cases home-treated in last 10 years.
		Hereford—					
64	—	Hereford U ..	Dr. A. M. Brown, M.O.H.	——	*To prevent the escape of scales whilst the body is peeling the body of the sick person is smeared with camphorated oil. Printed instructions issued	——	——

		Kent—					
65	In 1911	Beckenham U...	Dr. J. M. Clements ..	Tried on two cases ..	Milne treatment ..	Not reliable, as in second family another member developed scarlet fever	Not tried again.
66	—	*Bexley U.* ..	Dr. J. W. Hinds, M.O.H.	——	Milne inunction where possible	——	——
67	—	Northfleet U. ..	Dr. H. T. Sells, M.O.H.	Tried among home cases and on a training ship for boys	Milne treatment of inunction with sanitas oil, and throat treatment	Failed to produce satisfactory results	Most cases home treated.
68	—	*Faversham R.* ..	Dr. P. Selby, M.O.H.	Home cases and contacts	Application of eucalyptus oil. Visit and advise strict isolation, etc.	——	Most cases treated at hospital.
69	—	*Sheppey R.* ..	Dr. J. R. Wigglesworth, M.O.H.	——	Vigorous germicidal treatment of throat and nose, inunction of whole body with eucalyptus oil. Isolation	No further cases have arisen	Eleven out of 50 cases in last 10 years home-treated.
		Lancs.—					
70	—	Blackburn C.B.	Dr. W. A. Daley ..	Tried *in hospital* ..	Milne treatment ..	Unsatisfactory ..	Complications numerous. Patients erroneously sent in as scarlet fever contracted the disease although the Milne treatment was carried out.
See No. 23	—	*Audenshaw U.* ..	Dr. W. R. Judd, M.O.H.	Home-treated cases	Milne eucalyptus treatment. Isolation if possible	Seldom fails if thoroughly carried out	Fifty to 100 per cent. home-treated; 270 cases notified in last 10 years.

Serial No. (1)	Period of experiment or practice. (2)	Locality. (3)	Name and office of experimenter or reporter. (4)	Number and circumstances of cases treated. (5)	Methods of treatment employed. (6)	Results of treatment as recorded by those who adopted it. (7)	Remarks. (8)
*See No. 2	—	Bacup U. ..	Dr. J. P. Brown, M.O.H.	——	Carbolised oil supplied for about 40 years. Isolation	"I am very doubtful of its power as a germicide, and consider its use for so many years by mothers to rub on peeling children a great point in favour of peeling skin not being infectious, or I should think a large number of mothers would have contracted scarlet fever, which has not been the case"	340 cases notified in 10 years; most of them treated at home.
71	Since 1913	*Billinge U.* ..	Dr. R. O. Mather, M.O.H.	All cases	Eucalyptus oil and formenthe lozenges. Strict isolation	With satisfactory results	Forty-one cases home-treated in 10 years. Only one death since treatment started.
72	—	*Colne U.* ..	Dr. W. Doyle, M.O.H.	During the years when in private practice, and now in all home-treated cases	Modified Milne treatment. Isolation and disinfection	Found to be beneficial in preventing spread. The Council supplies also carbolic oil for inunction	560 cases notified in 10 years. Practically all treated at home.
73	—	*Croston U.* ..	Dr. A. Duckworth, M.O.H.	——	Early isolation. Anointing with carbolised oil for four weeks	——	Disinfection of house, bedding, clothes. Very few notifications.

See No. 31	Since June, 1914	*Denton U.* ..	Dr. W. Stewart, M.O.H.	In 80–90 per cent. of cases	Milne method. Separate room if possible	Result satisfactory ..	640 cases notified in 10 years. "Milne method adopted as a deliberate policy."
74	—	*Horwich U.* ..	Dr. J. S. Sewell, M.O.H.	Used when there was lack of hospital accommodation	Milne treatment. Separate room if available	"All our experience goes to show that not only does it prevent spread of infection, but with it secondary infections are most uncommon"	Most cases treated in hospital although nearly 200 cases home-treated in 10 years.
75	Since 1914	*Little Lever U.*..	Dr. J. S. Pickford, M.O.H.	All cases	Milne treatment. *No isolation*	"The results have been in every way eminently satisfactory"	In 1914, cost of hospital treatment amounted to £250; now under £30 per annum. 112 cases treated in last 9 years.
76	—	*Middleton U.* ..	Dr. S. T. Beggs, M.O.H.	Home-treated cases	Strict isolation and inunction. Eucalyptus oil supplied by Health Office	"Satisfactory as far as can be judged"	On an average between 35 and 60 per cent. of cases home-treated. Milne method recommended and local doctor's advised to follow same.
77	—	*Newton - in - Makerfield U.*	Dr. H. E. Watkins, M.O.H.	Home patients ..	Eucalyptus oil supplied on request of medical attendant	—	—
78	Epidemic of 1921–1922	*Oswaldtwistle U.*	Dr. A. E. Townley, M.O.H.	Home-treated cases	Eucalyptus oil supplied for outward application. Separate room if possible	Excellent results ..	Over 50 per cent. of cases treated at home during last three years.
79	—	*Standish with Langtree U.*	Dr. G. H. Ormsby, M.O.H.	Almost all cases (Home-treated)	Patients rubbed with eucalyptus oil supplied free by Council. Isolation.	"Results are quite satisfactory"	—
80	—	Swinton and Pendlebury U.	Dr. H. C. Mulholland, M.O.H.	In a few home-treated cases	"Eucalyptus oil" treatment	Results not conclusive	—

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		Leicester—					
81	—	*Market Harborough U.*	Dr. C. T. Scott, M.O.H.	Home-treated cases	Milne treatment ..	Every satisfaction when applied by skilled nurse	Practically all cases home-treated.
		Lincs.—					
82	—	*Horncastle U. and R.*	Dr. A. Boulton, M.O.H.	"For my own patients"	Inunction of equal parts of carbolic oil and eucalyptus oil. Strict isolation in one room	Beneficial results ..	——
83	—	Isle of Axholme R.	Dr. A. F. Messiter, M.O.H.	Home-treated cases	Eucalyptus inunction was tried for a few years	No noticeable result ..	All cases are home-treated.
84	—	Spilsby R. ..	Dr. F. J. Walker, M.O.H.	——	Milne treatment tried for a short time	Too short to form judgment; can only be carried out if a special nurse is employed	——
85	—	*Branston and Welton R.*	Dr. W. Sharrard, M.O.H.	Home cases	Milne treatment ..	——	Majority of cases are treated at home.
		Middlesex—					
86	During Epidemic 1914	*Chiswick U.* ..	Dr. R. Craske Leaning, M.O.H.	Lack of sufficient hospital accommodation	Milne treatment. Isolation, disinfection, etc.	Excellent results ..	75 cases isolated at home during the time.
87	—	*Harrow-on-the-Hill U.*	Dr. C. E. Goddard, M.O.H.	Home-treated cases	Milne treatment ..	Successful	Nine cases out of 20, in 1923, home-treated (Bibl. No. 204).
See No. 32	1922	Heston and Isleworth U.	Dr. E. H. T. Nash ..	Ten home-isolated cases	Milne treatment ..	Entirely satisfactory ..	

See No. 35	Commenced Apl. 3, 1922	*Tottenham U.* ..	Dr. D. C. Kirkhope, M.O.H.	Introduced on account of lack of hospital accommodation and continued as a deliberate policy	Milne treatment (modified)	"Results satisfactory as far as patients are concerned. The question is, whether secondary cases are more frequent or whether they are brought to light by the constant visitation of the houses and oversight of the contacts"	——
88	"Some years ago."	Twickenham U.	Dr. G. H. Dupont, M.O.H.	A short trial was given *in hospital*	Milne treatment ..	Inconclusive results ..	——
See No. 28	—	*Wealdstone U.* ..	Dr. R. P. N. B. Bluett, M.O.H.	Not through lack of hospital accommodation. The majority of cases home-treated	Modified Milne treatment now in force in district	Very satisfactory results	290 out of 390 cases home-treated in last 10 years.
		Norfolk—					
89	—	*Diss U.* ..	Dr. H. M. Speirs, M.O.H.	Only six cases notified since 1918	Patient rubbed from head to toe in carbolic or eucalyptus oil daily. Oils are supplied gratis. No hospital	——	——
90	—	*Docking R.* ..	——	All cases. (Home-treated.)	Free use of carbolic oil and antiseptics	——	390 cases in last 10 years.
		Northants.—					
91	—	Oundle U. ..	Dr. B. R. Turner, M.O.H.	Home-treated cases	Rubbing with eucalyptus oil. Spraying and gargling of throat	——	Only 15 cases notified in last 10 years. "I wished to try the Milne method some 15 years ago, but the L.G.B. said I must do so at my own risk."
92	Twenty years ago	Northumberland–Newcastle - on - Tyne C.B.	Dr. H. Kerr, M.O.H.	300–400 consecutive *cases in hospital*	Milne treatment ..	"Altogether unfavourable results"	"The treatment involved much labour upon the hospital staff and unnecessary discomfort to patients."

Serial No.	Period of experiment or practice.	Locality.	Name and office of experimenter or reporter.	Number and circumstances of cases treated.	Methods of treatment employed.	Results of treatment as recorded by those who adopted it.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
93	—	*Morpeth R.* ..	Dr. J. P. Philip, M.O.H.	All cases	Isolation and oiling of patients	Excellent results. Others in family seldom infected	602 cases treated in last 10 years.
		Notts.—					
94	—	*Hucknall U.* ..	Dr. W. Garstang, M.O.H.	Home-treated cases	An oil containing eucalyptus for patient's skin. Strict isolation	"Good result; seems to stop further infection in house"	400 cases notified in last 10 years. Only two cases ever treated in hospital.
95	—	*West Bridgford U.*	Dr. W. Hunter, M.O.H.	"In my own cases."	Inunction by eucalyptus	"I am a firm believer in inunction with eucalyptus oil"	286 notifications in last 10 years. All home-treated cases left to discretion of medical attendant.
		Oxford—					
96	—	*Banbury U.* ..	"A few medical men."	One or two cases ..	Eucalyptus treatment	"Cannot be relied upon except when a trained nurse is employed" (A. T. Johns, M.O.H.)	—
		Somerset—					
97	—	*Burnham-on-Sea U.*	Dr. F. C. Berry, M.O.H.	All cases. (Home-treated).	Inunction with eucalyptus oil and spraying throat with disinfectant. Isolation	Satisfactory results in many cases	67 cases notified in last 10 years.
98	—	*Frome U.* ..	Dr. G. Walker, M.O.H.	Home-treated cases	Patient isolated and anointed with carbolised eucalyptus oil	—	38 cases out of 64 home-treated in 1921; notifications few and most cases treated in hospital.

99	—	*Bridgwater R.* ..	Dr. W. Thompson, M.O.H.	All cases	Patients rubbed with eucalyptus oil daily during the whole of the illness. Isolation	——	211 cases notified in last 10 years. Only one case sent to hospital since 1907.
100	—	*Frome R.* ..	Dr. H. R. Codd, M.O.H.	Home-treated cases	Eucalyptus and disinfection. Strict isolation	——	77 cases home-treated out of 123 notified in last 10 years.
		Southants.—					
101	—	*Basingstoke B.* ..	Dr. W. H. Rees-Thomas, M.O.H.	——	Isolation and eucalyptus treatment	——	Only 10 cases out of 235 home-treated in 10 years.
102	—	Hursley R. ..	Dr. J. L. Livingston, M.O.H.	——	*Daily warm bath in sick room after disappearance of rash and daily inunction of an ointment containing acid carbolic, oil of eucalyptus and olive oil. Isolation, disinfection	——	55 out of 105 cases, notified in last 10 years, so treated.
103	—	*Kingsclere R.* ..	Dr. R. Maples, M.O.H.	——	Complete isolation and free use of carbolic oil	——	——
104	—	Whitchurch R.	Dr. F. R. Coates, M.O.H.	Cases in private practice	Application of olive oil and eucalyptus oil	"Could be done at home, but wants authoritative statement from Ministry of Health to support suggestion"	——
		Stafford—					
105	—	*Brownhills U.* ..	Dr. R. G. Bradford, M.O.H.	Contacts and inmates in house. All cases	Eucalyptus oil treatment. Isolation and disinfection	Very good results if carried out systematically and thoroughly	567 cases notified in last 10 years.
106	—	*Kidsgrove U.* ..	Dr. J. Steele, M.O.H.	Several cases ..	Milne method	With good results ..	——
107	—	Tamworth U. and R.	Dr. H. J. Fausset, M.O.H.	——	*Some cases have disinfecting baths and are rubbed with eucalyptus ointment, but as a rule no special treatment is carried out	Successful in some instances	——

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108	—	*Tipton U.* ..	Dr. A. S. Underhill..	——	Inunction, isolation, etc.	——	50 per cent. of notified cases home-treated.
		Suffolk E.—					
109	—	Ipswich C.B. ..	Dr. A. M. N. Pringle, M.O.H.	——	Milne treatment tried..	Nil	——
110	—	Woodbridge R.	Dr. E. Hollis, M.O.H.	In the Frimley epidemic	Eucalyptus oil was used freely	Cannot be regarded as satisfactory. Seven deaths out of 82 cases	*See* Ann. Rept. for 1913.
		Suffolk W.—					
111	—	*Newmarket U.* ..	Dr. J. H. Maund, M.O.H.	——	One medical man uses carbolic inunctions	"With good results, he says" (J. H. Maund)	——
		Surrey—					
112	Since 1915	Epsom: Branch of Barnardo's Home	Dr. J. Williamson, M.O.H.	All cases	Inunction with eucalyptus oil during the acute stage. Isolation not observed after 3rd week	Five invasions by the disease during the time but only eight cases in all	——
		Warwick—					
113	In 1914	Nuneaton B. ..	Dr. K. E. Tapper, M.O.H.	——	Milne treatment ..	With apparent success. "In my opinion home-nursing without Milne routine is just as successful and still more economical"	(Bibl. Nos. 184 and 187*b*).
		Wiltshire—					
114	—	Salisbury U. ..	Dr. E. T. Fison, M.O.H.	Home-treated cases	*During stage of peeling patient's skin rubbed daily with vaseline or sweet oil. Printed instructions issued	——	——

		Yorks. N.R.					
115	—	*Kirklington cum Upsland U.*	Dr. A. H. Sevier, M.O.H.	All cases	Inunction with eucalyptus oil, strict disinfection, and isolation where possible	Satisfactory	17 cases notified in 8 years.
116	Once during the war	Aysgarth R. ..	Dr. D. Dunbar, M.O.H.	One case	Child treated at home by swabbing throat twice a day with carbolic oil and anointing skin with eucalyptus oil	The other child did not contract scarlet fever	——
117	—	*Northallerton R.*	Dr. J. A. Hutchinson, M.O.H.	Home-treated cases	Early and continuous inunction together with special attention to nose and throat. Isolation and disinfection	——	115 cases notified in 10 years. 79 out of 115 cases home-treated during 10 years.
		Yorks., W. R.—					
118	Since 1910	*Barnoldswick U.*	Dr. H. C. Alderton, M.O.H.	In case of patients *admitted to hospital*	"I strongly advocate the Milne treatment provided it is properly carried out"	"It practically abolishes return cases, lessens the period in hospital, and prevents complications." The type of scarlet fever has been mild for the past 10 years	200 cases notified in last 10 years, and nearly all treated in hospital.
119	During the last two years	*Castleford U.* ..	Dr. W. Kemp, M.O.H.	Home-treated cases. During 1922 and 1923 there were 54 cases treated by Milne method	A modified form of the Milne treatment has been tried as a deliberate policy	Very satisfactory results	140 cases home-treated in 10 years (Bibl. No. 208).
120	—	*Darton U.* ..	Dr. R. Millar, M.O.H.	Home cases	Inunction with eucalyptus oil. Isolation and disinfection	With probably favourable result	——
121	—	*Drighlington and Gildersome U.*	Dr. W. H. Holliday, M.O.H.	One-third home-treated	Eucalyptus oil inunction. Isolation and disinfection	Good results	——

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122	Since Aug., 1910	*Earby U.* ..	Dr. A. Falconer, M.O.H.	——	Milne treatment inunction. Strict isolation	Satisfactory if carried out thoroughly by nurse trained in treatment	44 out of 51 cases home-treated during last 10 years.
123	—	*Goole U.* ..	Dr. A. M. Erskine, M.O.H.	*In hospital*	Milne treatment is carried out	——	——
124	—	*Keighley U.* ..	Dr. W. Scatterty, M.O.H.	Home cases, during periods when hospital accommodation insufficient	Eucalyptus inunction ..	——	61 cases out of 414 home-treated in last 10 years.
125	—	Pontefract B. ..	Dr. W. T. Hessel, M.O.H.	One case	Rubbing with sanitas oil has been tried in the case nursed at home	——	Very few cases treated at home.
126	—	Springhead U. ..	Dr. W. Oliver, M.O.H.	All cases	*Regular baths. Skin anointed with eucalyptus oil	Rarely do we get a secondary case	155 cases home-treated in last 10 years.
127	Some years ago	Wombwell U. ..	Dr. J. C. Pickup, M.O.H.	——	Milne treatment tried ..	Result uncertain ..	Since 1919 most cases treated in hospital.
128	—	*Bowland R.* ..	Dr. W. H. Ross, M.O.H.	All cases	Strict isolation, disinfection, "application of oil, etc."	In a rural area, home treatment quite as successful as hospital treatment would be	47 cases home-treated during last 10 years.
129	—	*Thorne R.* ..	Dr. J. M. Taylor, M.O.H.	Home-treated patients	Eucalyptus oil is supplied free	"I think it prevents infection of other children"	38 out of 59 cases home-treated in last 5 years.
130	—	*York C.B.* ..	Dr. E. M. Smith, M.O.H.	——	Oiling recommended but left to medical attendant. Printed instructions issued	——	——

		Wales—					
131	—	*Abertillery U.* ..	Dr. T. B. Smith, M.O.H.	Milne treatment carried out in home-treated cases as a deliberate policy	Patients rubbed all over with eucalyptus oil. Later, warm baths given to assist peeling. Strict isolation, disinfection. Printed instructions issued	"I consider the treatment gives good results."	—
132	—	*Burry Port U.* ..	Dr. C. M. Williams, M.O.H.	Home-treated patients	Inunction with antiseptic oils. As complete isolation as possible, together with free use of disinfectants	Results appear satisfactory with regard to prevention of spread	165 cases home-treated in last 10 years.
133	—	*Colwyn Bay and Colwyn U.*	Dr. W. M. Venables-Williams, M.O.H.	Home-treated patients	Strict isolation and eucalyptus oil	Satisfactory	71 out of 238 cases home-treated in last 10 years.
134	—	*Dolgelly U. and R.*	Dr. H. Jones, M.O.H.	All cases home-treated. No hospital in County	Eucalyptus oil is supplied in all cases for inunction. An attempt is made to secure a separate room	The experience of Dr. Barnardo's Homes led me to advise this. I am convinced of its value	Cases average one a year in the urban and 10 a year in the rural district.
135	—	*Llandudno U.* as for *Carnarvonshire C.D.*	Dr. G. L. Travis, M.O.H.	Home-treated cases	The smearing of eucalyptus or camphorated oil over body every day advised. Printed instructions issued.	—	—
136	—	Prestatyn U. ..	Dr. L. T. Griffiths, M.O.H.	Home-treated cases	*Anointing with eucalyptus oil during desquamation. Isolation	Satisfactory, but always an anxiety	18 out of 28 cases home-treated in last 8 years.
137	—	*Welshpool U.* ..	Dr. J. A. Crump, M.O.H.	All home-treated cases	Inunction with eucalyptus oil. Painting fauces with carbolised oil	—	35 cases notified in last 10 years.
138	—	*Aberystwyth North R.*	Dr. J. James ..	All home-treated cases	Inunction with carbolic oil 1 in 30. Isolation	—	191 cases notified in last 10 years.

Serial No.	Period of experiment or practice.	Locality.	Name and office of experimenter or reporter.	Number and circumstances of cases treated.	Methods of treatment employed.	Results of treatment as recorded by those who adopted it.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
139	—	*Hay R.*	Dr. F. J. Jayne, M.O.H.	All home - treated cases	No particular methods for home isolation. Always put in separate room. Carbolic oil swabs for throat, and eucalyptus oil rubbed all over body.	Apparently good results	65 cases notified in last 10 years.
140	—	Whitland R. ..	Dr. W. H. Owen, M.O.H.	All home - treated cases	*Application of eucalyptus oil during peelling found very effective. As thorough isolation as possible, often extremely difficult	——	34 cases notified in last 10 years.
141	—	N. Oxfordshire C.D.	Dr. E. Morton, M.O.H.	" In some cases " ..	Inunction with olive and eucalyptus oils	With apparently satisfactory results	——
142	—	Craven (Keighley) C.D.	Dr. F. E. Atkinson ..	Occasionally in home-treated cases	Eucalyptus inunction ..	Good results where nursing was good	——
See No. 33	1922	Horsham U.D. in Northern C.D. (W. Sussex)	Dr. S. Child	Lack of hospital accommodation ..	Modified Milne method	No second case in same house	Experiment cut short by death of a nurse.
		Ireland—					
143	12 years ago	Belfast	Dr. A. G. Robb, Vis. Phys. in charge Belfast Fever Hospitals	Series of 100 consecutive cases *in hospital*	Swabbing of the whole fauces with 1 in 10 carbolic acid in olive oil : thoroughly carried out	Very disappointing results. " Never have we had a larger proportion of ear and gland troubles in any series of cases "	" Inunction with eucalyptus oil was not done in these cases as our object was not the prevention of the spread but the prevention or reduction of complications " (Bibl. No. 210).

APPENDIX N

Districts in which the practice of disinfection is unusual in some respects.

District and County.	Population.	Mattresses, palliasses, etc. (*a*)	Bedclothes and personal garments. (*b*)	Furniture. (*c*)	Toys and books. (*d*)	Utensils. (*e*)	Room. (*f*)	Total number of cases of scarlet fever during the last 3 years.
Ampthill U. Beds.	2,228	"*No special methods*"	Fumigated ..	Fumigated ..	Destroyed ..	"*No special methods*"	Fumigated ..	3
Wallasey C.B. Cheshire	90,809	Steamed ..	Steamed ..	*Nil*	Fumigated in air-tight cupboard	*Nil*	*Nil*, unless in verminous condition	872
Lostwithiel R. Cornwall	1,299	"*No special method*"	"*No special method*"	"*No special method*"	Destroyed ..	Scalded	Sulphur candles	4 (2 years)
Arlecdon and Frizington U. Cumberland	5,230	*Thoroughly aired*	*Washed if possible; if not, thoroughly aired*	Scrubbed down if possible	Dusted and cleaned up	Thoroughly washed	Fumigated with sulphur	7
Blandford U. & R. Dorset	11,317	Steamed ..	Steamed ..	Fumigated ..	Fumigated with sulphur	*Nil*	Fumigated with sulphur	85
Hartlepool U. Durham	20,997	*None*	Washed ..	Fumigated ..	Destroyed ..	"*Thrown into drain after treatment with disinfectant*"	Formalin lamp	110

District and County.	Population.	Mattresses, palliasses, etc. (*a*)	Bedclothes and personal garments. (*b*)	Furniture. (*c*)	Toys and books. (*d*)	Utensils. (*e*)	Room. (*f*)	Total number of cases of scarlet fever during the last 3 years.
Chelmsford B. Essex	20,761	Steamed ..	Steamed ..	Fumigated ..	Fumigated ..	*None*	Formalin vapour	78
Chatham U. Kent	42,665	Steamed ..	Steamed ..	*Cleansed*	Usually destroyed	*Cleansed*	*Floor well scrubbed, paintwork washed, room freely ventilated*	283
Gillingham U. Kent	54,038	Steamed ..	Washed in disinfectant solution	*Spring cleaned; floors and woodwork washed*	Disinfected in formalin chamber	Scalded	*Spring-cleaned*	433
Lees U. Lancashire	4,907	"*None*" ..	"*None; advise carbolic washing*"	Fumigated ..	Destroyed ..	Washed in disinfectant	Sprayed and fumigated with sulphur	44
Leicester C.B.	237,900	Sprayed ..	Sprayed ..	Sprayed	*Sprayed*	Washed	Sprayed	2,279 (1920–22 inclusive)
Leigh U. Lancashire	45,545	"*Steam disinfection in some cases*"	"*None*" ..	Fumigated ..	Destroyed ..	*None*	Formalin.. ..	494

St. Helens C.B. Lancashire	102,675	Steamed ..	Steamed ..	Sprayed	Removed for disinfection or destroyed	*"No particular action taken"*	Sprayed	680
Manchester C.B. Lancashire	730,307	Steamed ..	Steamed ..	Washed with chloride of lime solution	Removed for fumigation or destroyed	—	*Paper stripped when necessary. Walls, floor and ceiling washed with solution of chloride of lime*	12,847 (1920–22)
Spalding U. Lincolnshire	10,702	*None*	*None*	*None*	*None*	*None*	Formalin vapour	24
Acton U. Middlesex	61,299	Fumigated	Sprayed and fumigated	Sprayed and fumigated	Removed and fumigated	*No special disinfection*	Spraying and fumigating	1,095
		HOME CASES.						
Tottenham U. Middlesex	146,711	*None*	*None*	*None*	*None*	*None*	*None*	2,366
Ealing and Hanwell Middlesex	67,755 20,481	Steamed ..	Steamed ..	*None*	*None*	*None*	*None*	353 (1917–19 inclusive) 631 (1921–23, inclusive)
Aylsham R.	16,280	*None*	*Parents told to boil them*	Fumigated ..	Fumigated ..	Scalded	Fumigation with sulphur.	No figures
Blofield R. Norfolk	11,214	*None*	Do.	Do.	Do.	Do.	Fumigation with formalin	

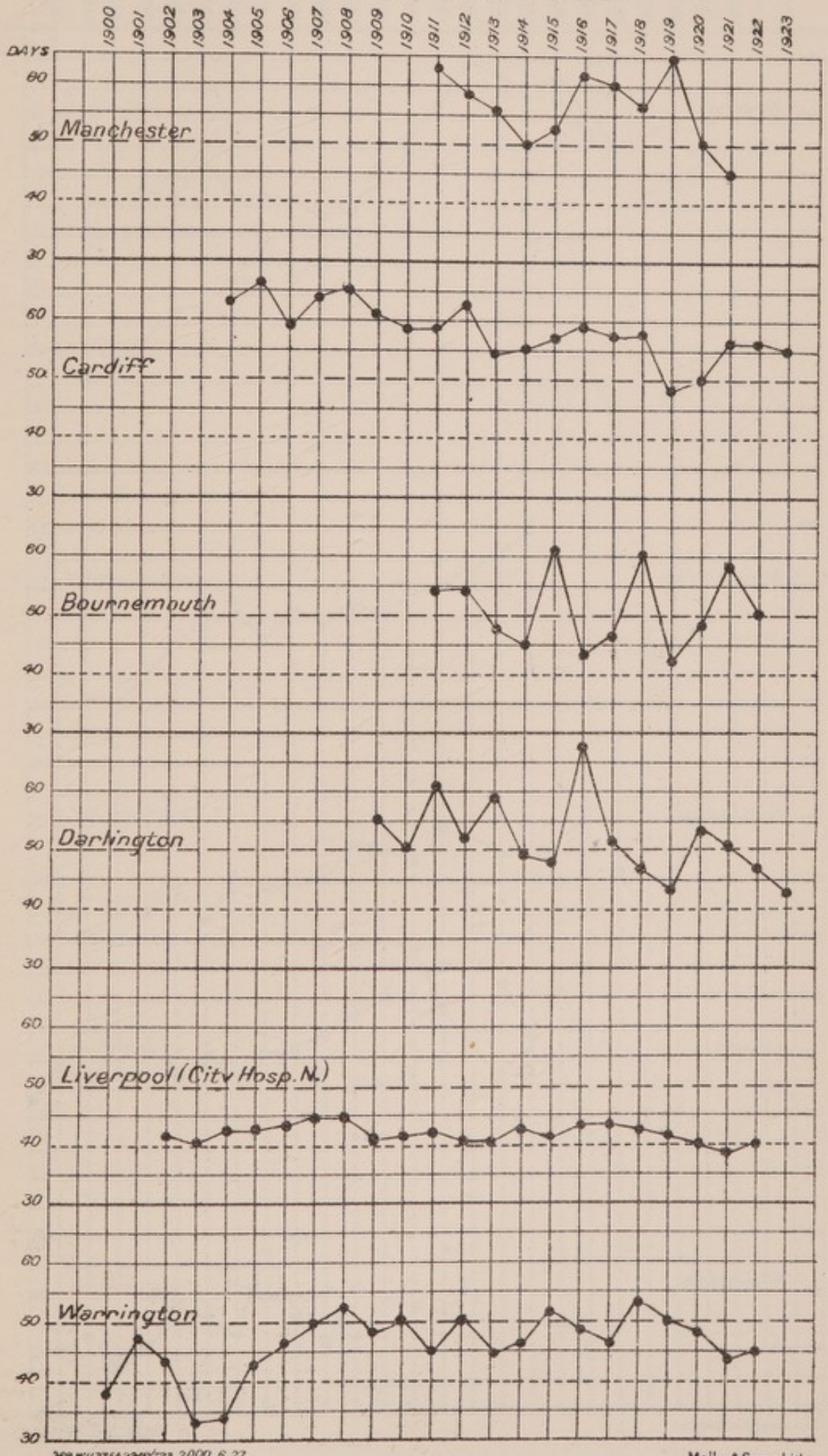
District and County.	Population.	Mattresses, palliasses, etc. (*a*)	Bedclothes and personal garments. (*b*)	Furniture (*c*)	Toys and books (*d*)	Utensils (*e*)	Room (*f*)	Total number of cases of scarlet fever during the last 3 years.
Downham U. & R. Norfolk.	14,840	*Exposed to open air*	Washed ..	Cleaned	Generally destroyed	—	Thoroughly scrubbed, walls and floors sprayed, paper stripped off walls.	104
Huthwaite U. Notts.	5,560	*Nil*	*Nil*	*Nil*	Destroyed ..	*Nil*	Sulphur gas ..	No figures
Sutton U. Surrey	21,063	Steamed ..	Steamed ..	*Nil*	Toys destroyed or sent to Hosp. *Books Nil* ..	Scalded	Sprayed	82
Brighton C.B. Sussex	142,427	*Nil*	Boiled or washed	*Spring-cleaned*	Destroyed ..	Scalded	*Spring-cleaned*	1,164
Leamington Spa U, Warwick	28,560	Steamed ..	Steamed ..	Fumigated ..	Fumigated ..	*Nil*	Fumigated ..	143
Trowbridge U. Wiltshire	12,130	Steamed ..	Steamed ..	Sprayed	Sprayed	*No special treatment*	Spray	34

Martley R. Worcester	12,471	*None*, except in special cases	Fumigated and boiled	Washed in disinfectant	Destroyed ..	Washed in disinfectant	Sprayed and fumigated	46
Kirklington-cum-Upsland U. Yorks. N.R.	246	*None*	—	—	—	—	Thoroughly disinfected after recovery of patient	8
Dewsbury C.B. Yorkshire	54,165	Steamed ..	Steamed ..	Sprayed	Destroyed ..	"*No special methods*"	Sprayed and fumigated	543
Halifax C.B. Yorkshire	100,700	Steamed ..	Steamed ..	*Spring-cleaning advised*	Destroyed ..	"*No special disinfection other than washing*	*Spring-cleaning*	849 (1920, 1921, 1922)
Camberwell M.B.	267,198	Steamed ..	Steamed ..	Sprayed	Destroyed or fumigated	*Nil*	Sprayed, walls stripped and ceiling white-washed where necessary	No figures
Vaynor and Penderyn R. Brecon	5,674	Steamed ..	Steamed ..	Sprayed	Destroyed ..	*No special treatment*	Sulphur fumigation	21
Aberystwyth R. Cardigan.	5,075	*Well beaten and hung out in the wind and sun*	*Washed and put out to dry in the wind and sun*	Washed with "Killgerm" fluid and fumigated with paraldehyd gas	Washed with "Killgerm" and books fumigated with paraldehyd gas	Washed in "Killgerm" fluid	Wallpaper removed and walls fumigated and floors washed	35

District and County.	Population.	Mattresses, palliasses, etc. (*a*)	Bedclothes and personal garments. (*b*)	Furniture. (*c*)	Toys and books. (*d*)	Utensils. (*e*)	Room. (*f*)	Total number of cases of scarlet fever during the last 3 years.
Whitland R. Carmarthen	5,010	*Exposed to fresh air and wind for 2 days*	Boiled ..	Sprayed	Burnt	Boiled	Spring-cleaned, re-papered and sprayed	1
Hawarden R. Flintshire	24,220	*Exposed to fresh air*	Boiled and washed in disinfectants	Sprayed	Destroyed or sent to hospital	Washed	Fumigated with sulphur and sprayed	185
Ogmore U. Garw & Glam.	30,850	Fumigated. Covers washed in disinfectant	Fumigated and washed in disinfectant	Fumigated ..	Fumigated ..	*Nil*	Fumigated ..	646
Abergavenny R. Mon.	9,050	*Exposed to fresh air*	Soaked in disinfectant and boiled	Washed with disinfectant	Burnt	Boiled	Fumigated ..	84 (1919–1921 inclusive)
Abersychan U. Mon.	27,620	Steamed ..	Steamed ..	Fumigated ..	*No steps taken*	Thoroughly cleansed	Fumigated ..	238
Bedwas and Machen U. Mon.	8,620	Fumigated ..	*None*	*None*	*None*	*None*	Lamp and sulphur	73

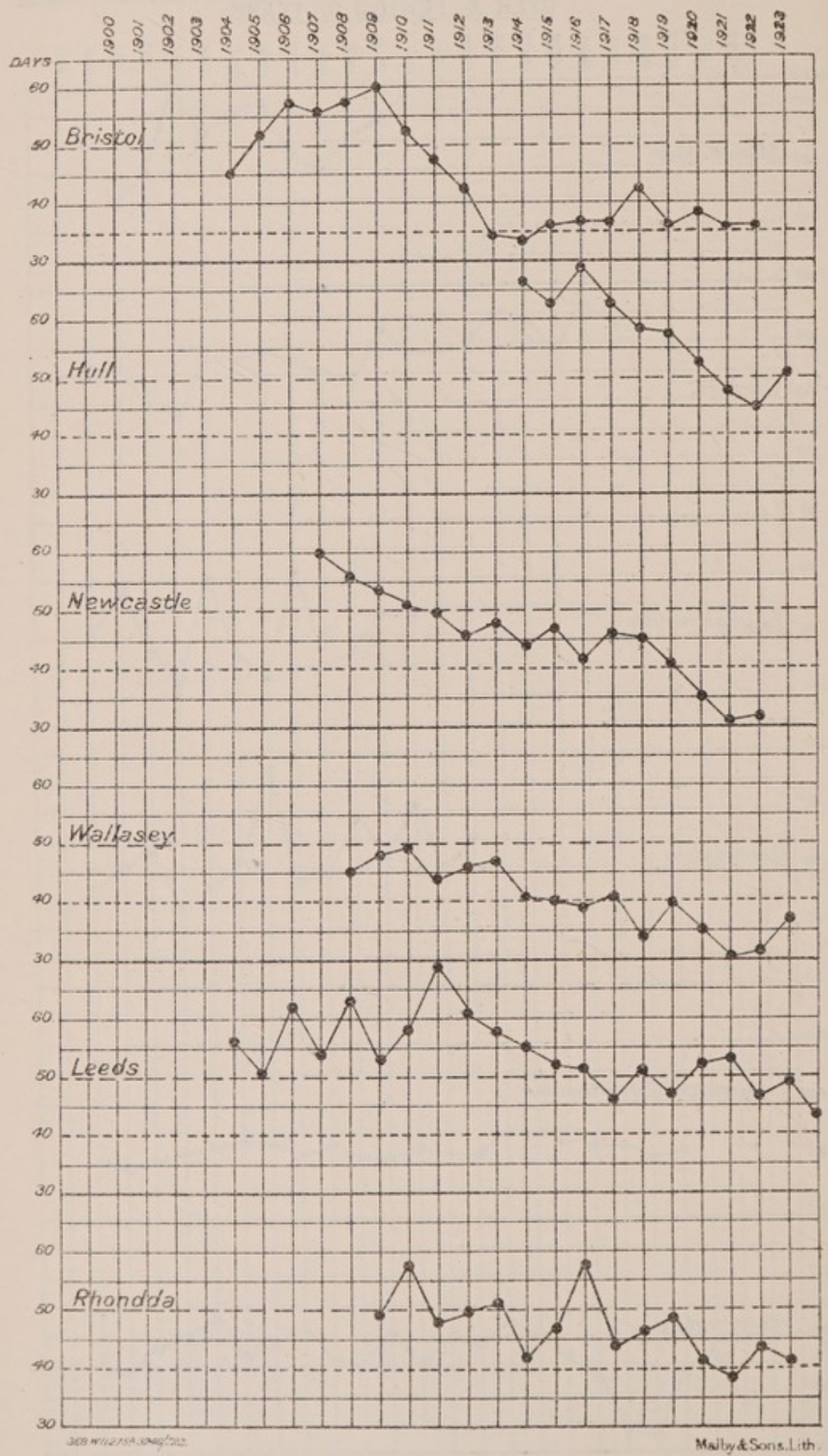
New Radnor R. Radnor	24,220	*Exposed to fresh air*	Washed and exposed to air	Sprayed or sulphur burnt	Burnt	Washed in disinfectant	Sprayed or sulphur burnt	185
Biggleswade U. & R.	28,622	Steamed ..	Steamed ..	See room ..	*No action taken*	*No action taken*	Sulphur fumigation	177
Huntingdonshire C.D.	36,181	Stoved.. ..	Stoved.. ..	—	—	—	Formaldehyde lamp	16 in 1921
Ulverston C.D.	41,685	Fumigation	*None*	*None*	*None*	*None*	Formalin and sulphur	189
Mid-Warwickshire C.D.	124,660	Steamed ..	Steamed ..	Spray or lamp	Destroyed ..	*Washing only*	Spray or lamp. Re-papered if necessary	912
Selby C.D.	58,024	Sprayed ..	Steamed ..	Sprayed	Sprayed	*Instructions to wash only*	Sprayed	336

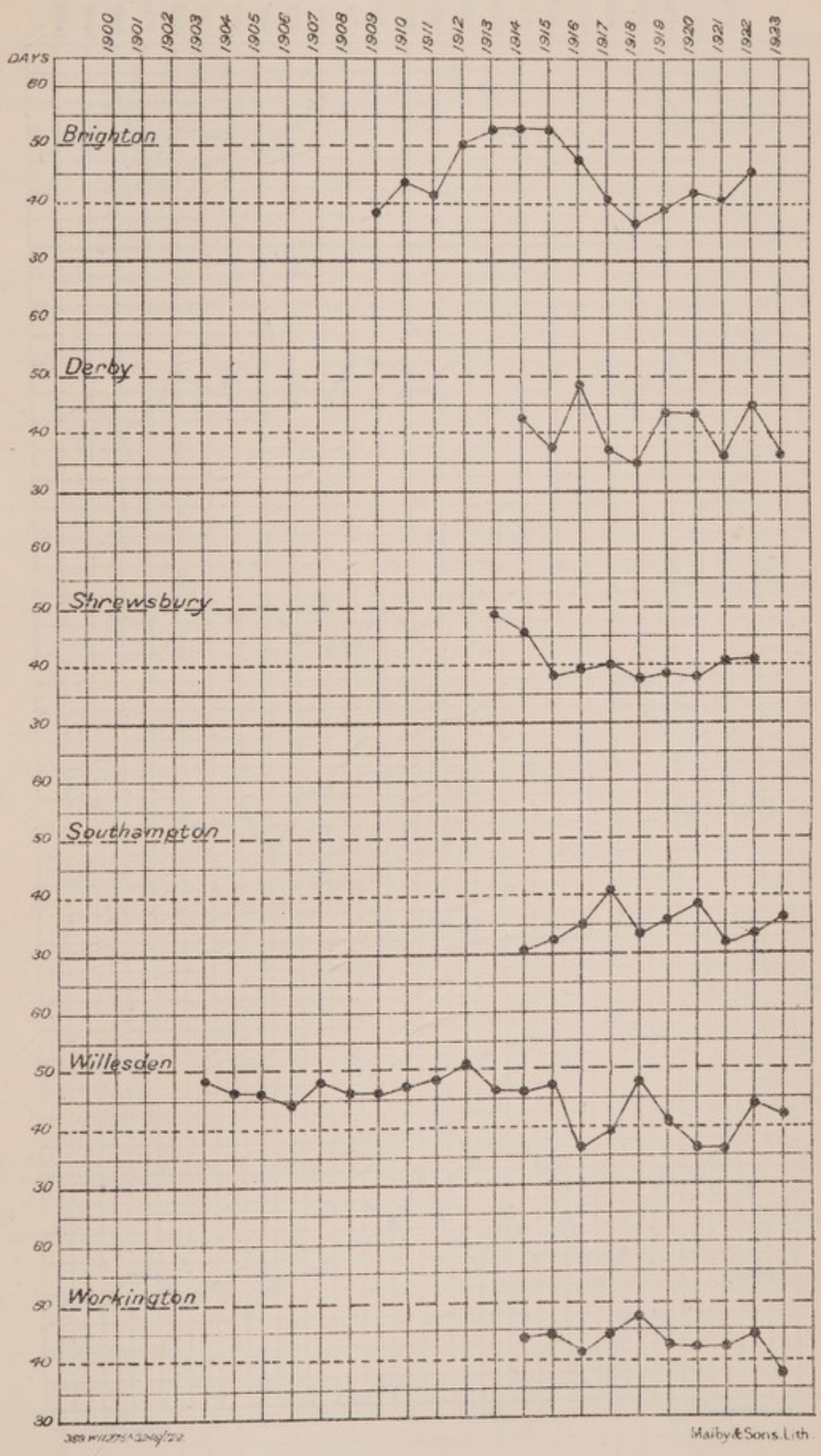
GRAPHS SHOWING MEAN LENGTH OF STAY IN VARIOUS HOSPITALS OVER A PERIOD OF YEARS.

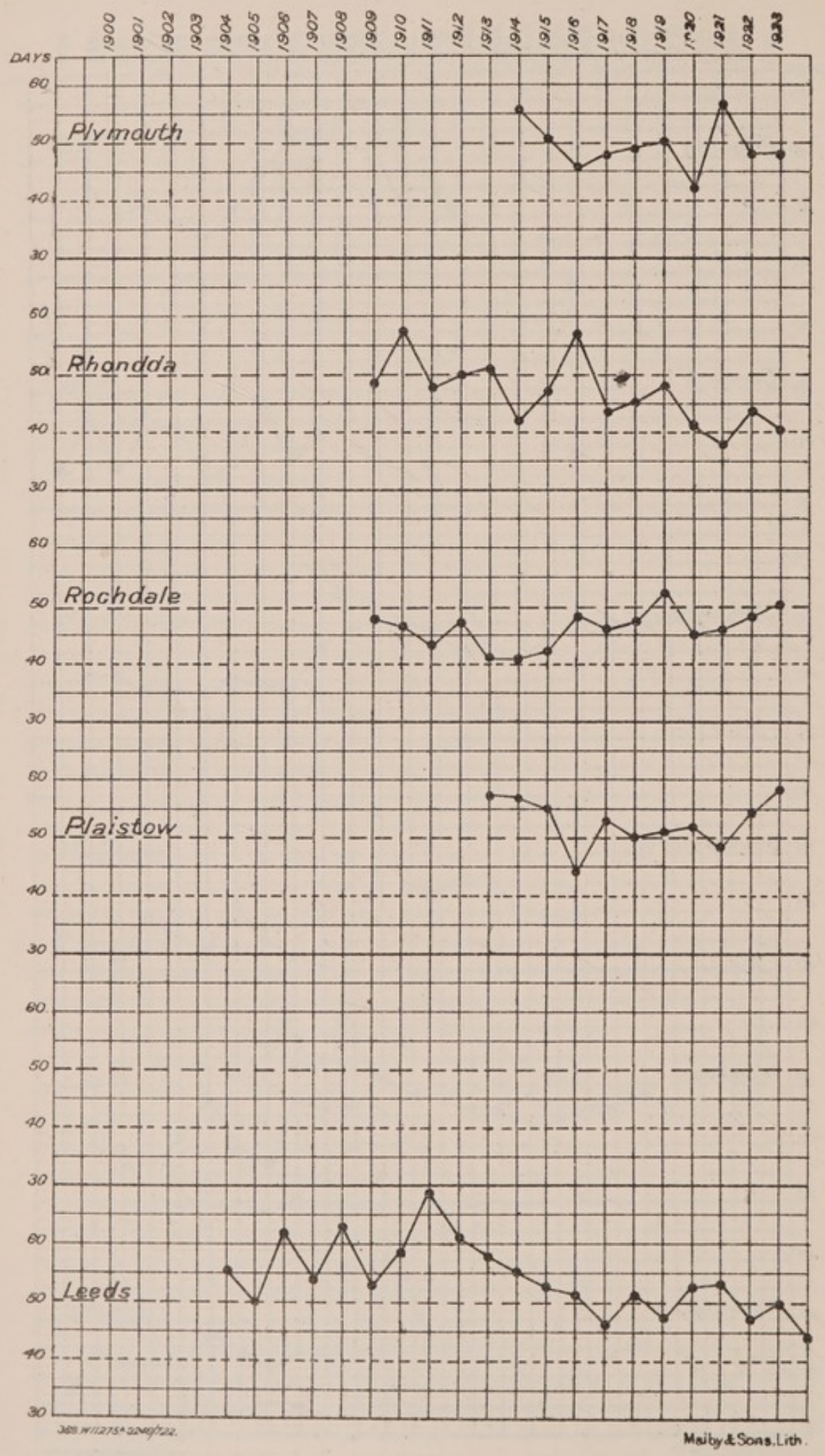


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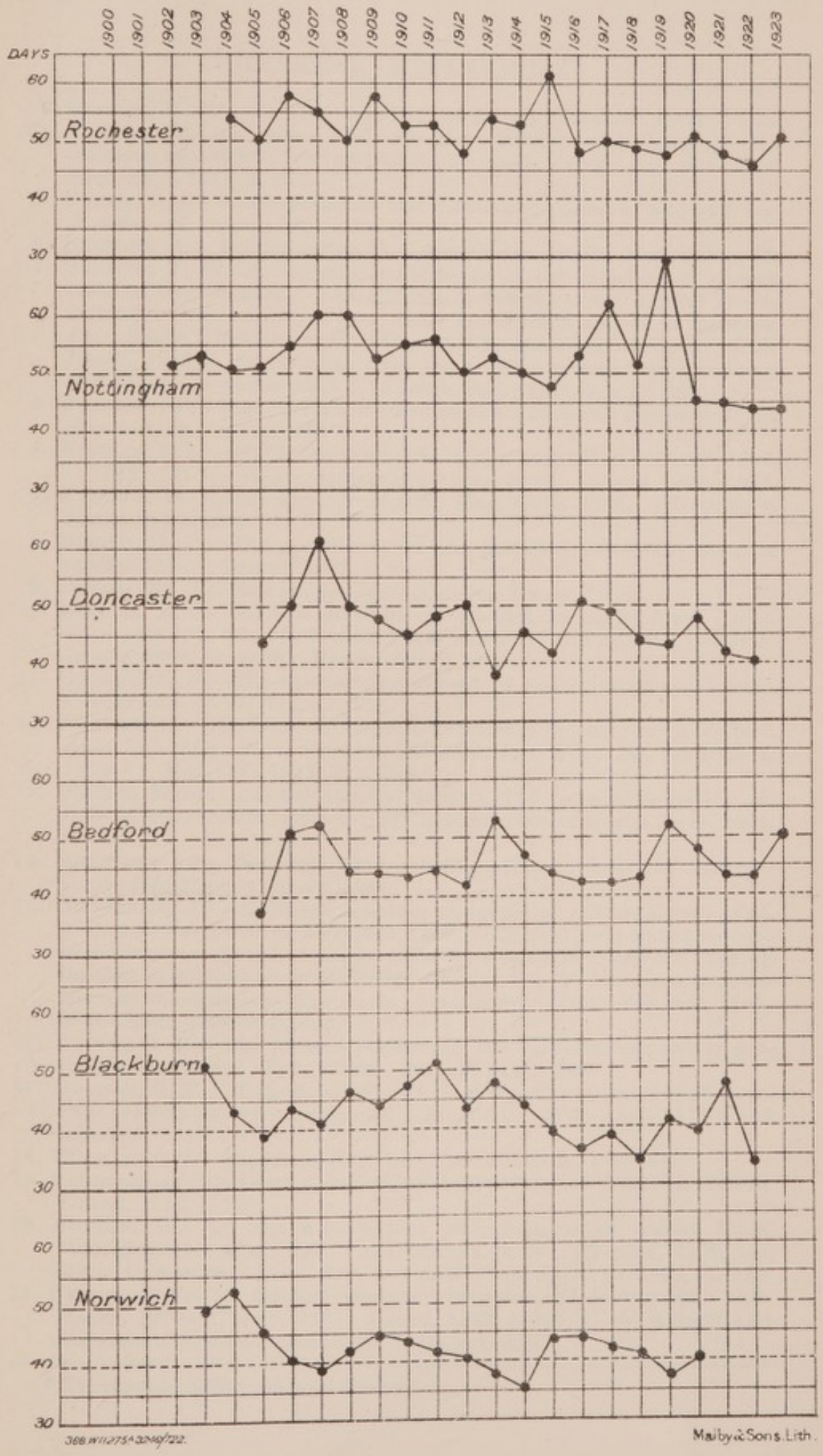

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* This should be Rundle and Burton.

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