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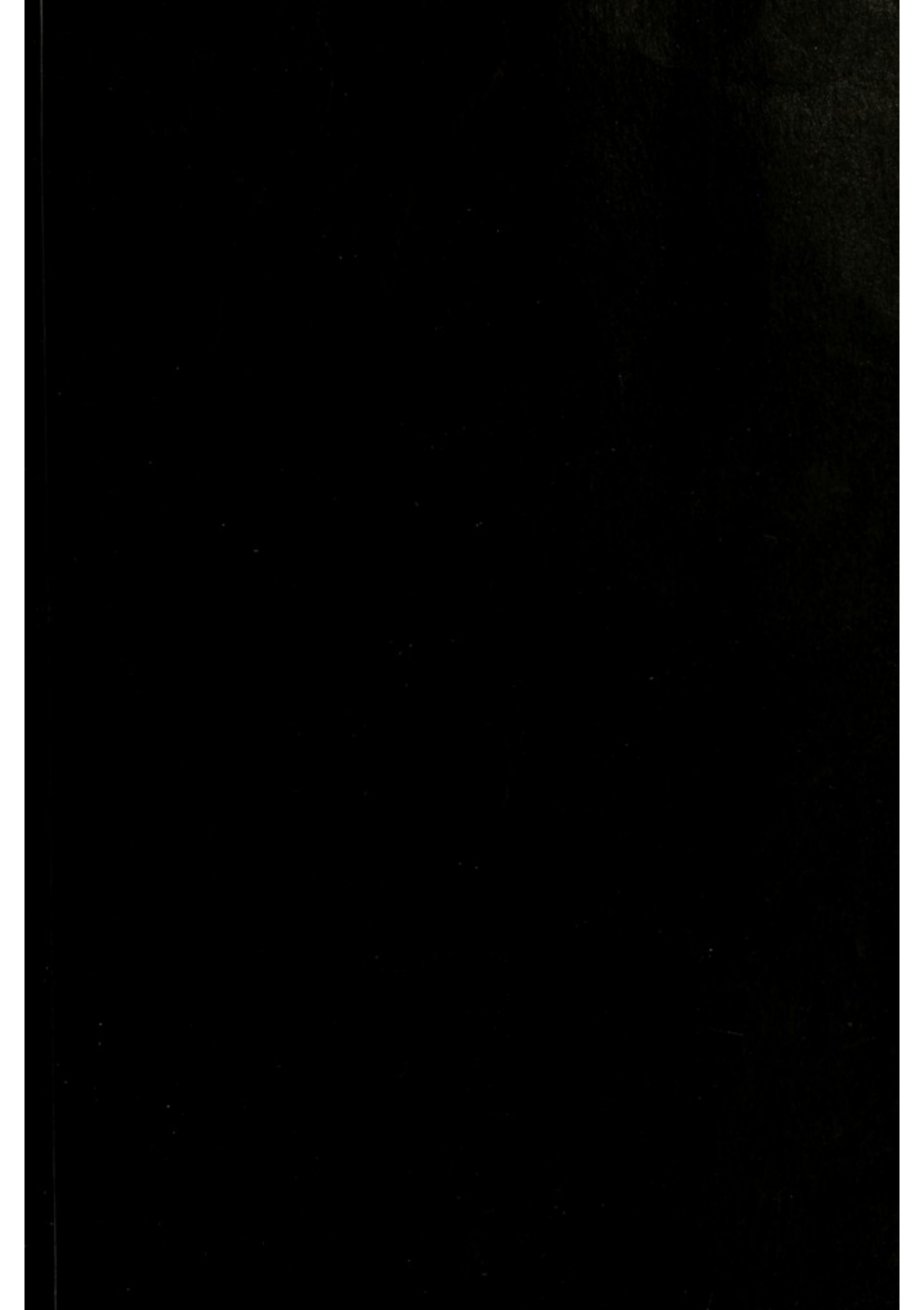
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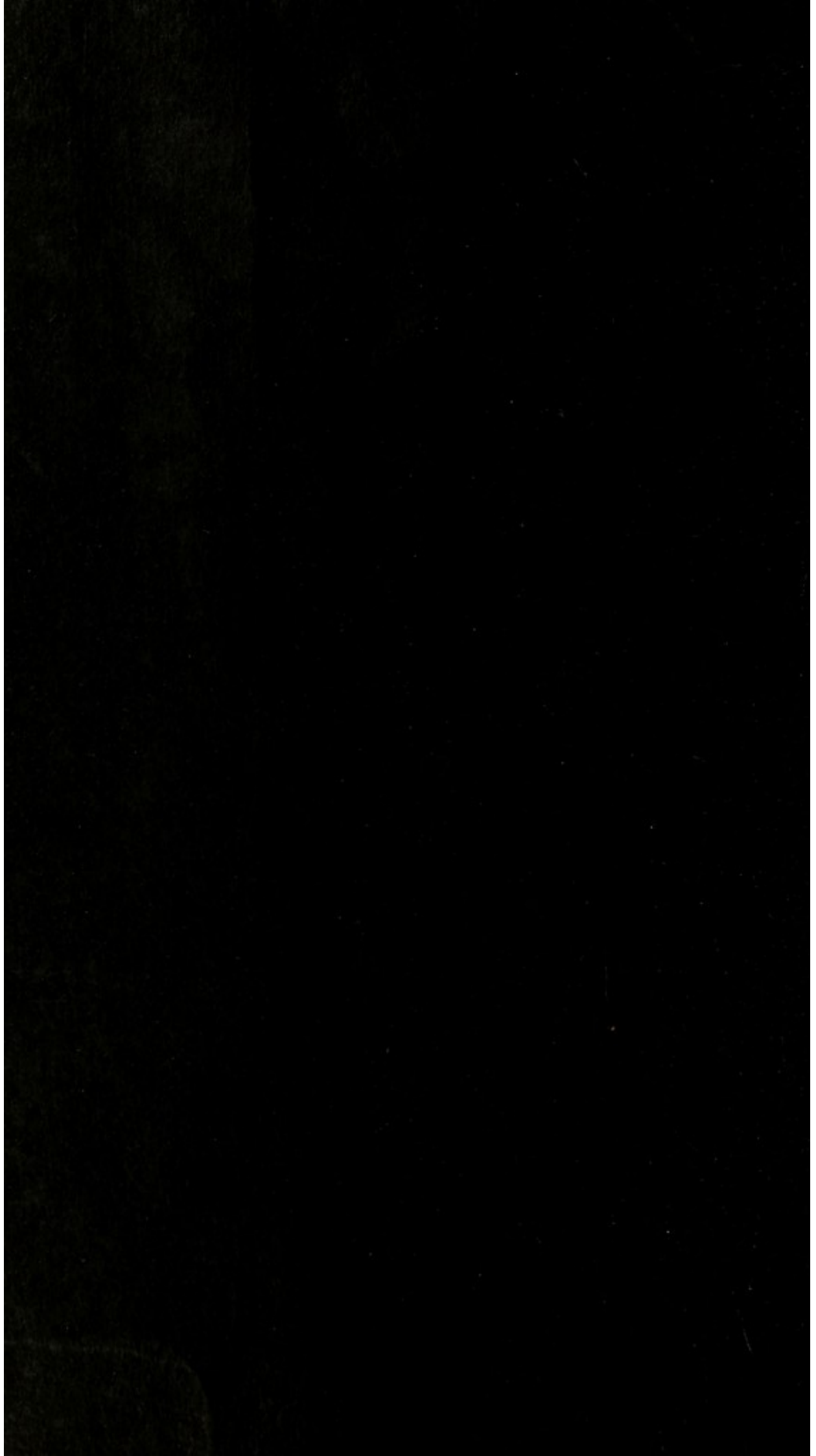
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ON THE
STATISTICS
OF THE
RECENT EPIDEMIC OF TYPHUS
IN
ABERDEEN,
SHOWING ITS PROBABLE CAUSE AND COST.

BY
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ON THE STATISTICS OF THE RECENT EPIDEMIC OF TYPHUS IN ABERDEEN.

FOR almost three years Aberdeen has been the seat of an epidemic of typhus, which, although the relative mortality has not been high, has yet been wide-spread. I propose to trace, as far as practicable, the history of this epidemic, and to endeavour to ascertain what conclusions are fairly deducible therefrom, especially in the view of approximating to its probable cause and cost ; and in order to avoid those sources of error which unreliable or only partially reliable data necessarily give rise to, I shall, in the first place, confine myself to the statistics of those cases admitted into the Royal Infirmary, the facts connected with which are absolutely known. During the prevalence of the epidemic very few cases of other febrile diseases were admitted into the infirmary; still a few cases of typhoid fever did occur along with a small but remarkably uniform number of cases of small-pox. There also occurred occasional mild cases of fever, unattended with eruption, which are recorded in the hospital books as febricula ; but the following observations apply solely to the cases of pure typhus, the others having been carefully separated. Before proceeding to the details of these I may premise that by pure typhus I understand a febrile disease marked by the appearance of a dark mulberry-coloured rash, coming out after the disease has lasted a day or two, and continuing out till the disease is over, and by the prominent symptoms referring to disturbed function of the brain. In all the cases now to be referred to, the characteristic rash was present.

The epidemic seems to have broken out in September, 1863. The number of cases, however, during that month was not great, but in the next month, October, 1863, they were nearly trebled, and through November and December continued to rise steadily. Towards the end of January, 1864, they fell somewhat, and then continued nearly stationary through February and March. During April and the early part of May, 1864, the number of cases dwindled considerably. In the end of May, however, there was a sudden rise, and a similar one in the middle of June, but, with these exceptions, the number of fresh cases continued to diminish until August, 1864 presented the same number as the first month of the epidemic, September, 1863. In September, 1864, the number again rose rapidly, being not far short of double that of the preceding month, and this rise was kept up during the next month, October, but fell somewhat in the two remaining months of 1864. January, 1865, showed a slight increase, followed by a decided fall in February, to a point lower than had been reached since the outbreak of the disease; but this gave way to a steady increase, continuing through March, April, May, and commencement of June. The latter part of June and July produced a very rapid fall to a point lower than had yet occurred; but in August the number rose to nearly the same as in August, 1864. September witnessed a further slight rise, but much less than in the preceding year, while in October and November a slight fall occurred, which increased in December. The commencement of 1866, during the first two months, produced little change, but in the beginning of March a rise occurred, which, however, did not continue. April produced a slight decline, which continued during May, after the middle of which month the disease rapidly subsided. June produced few cases, and the whole may be said to have then ceased, as only an occasional stray case occurred afterwards.

The following table will show the number of admissions; the months being for the sake of convenience divided into four parts each; the first fifteen days into periods of eight and seven days respectively, and the remainder of each month into periods of eight and seven days, or into two periods of eight days each according as there are 30 or 31 days in the month. These periods may be roughly styled weeks.

TABLE I.—NUMBER of ADMISSIONS into the HOSPITAL.

1863-64.	Per Week.	Month.	4 Months.	1864-65.	Per Week.	Month.	4 Months.	1865-66.	Per Week.	Month.	4 Months.
1863. SEPT. {	6 11 4 8	29	336	SEPT. {	23 4 11 12	50	167	SEPT. {	10 3 14 11	38	125
OCT. {	18 17 15 33	83		OCT. {	11 14 7 16	48		OCT. {	8 5 7 10	30	
NOV. {	16 19 33 23	91		NOV. {	11 6 6 9	32		NOV. {	11 6 10 6	33	
DEC. {	33 31 37 32	133		DEC. {	9 7 10 11	37		DEC. {	5 5 5 9	24	
1864. JAN. {	35 30 30 20	115	427	1865. JAN. {	1 18 12 15	46	157	1866. JAN. {	6 5 5 12	28	113
FEB. {	24 32 35 24	115		FEB. {	5 9 11 1	26		FEB. {	7 7 3 5	22	
MARCH {	35 8 28 27	118		MAR. {	7 15 7 7	36		MAR. {	18 3 4 9	34	
APRIL {	19 29 23 8	79		APRIL {	14 13 8 14	49		APRIL {	5 5 14 5	29	
MAY {	13 12 19 34	78		MAY {	20 13 12 16	61		MAY {	9 8 1 6	24	

1863-64.	Per Week.	Month.	4 Months.	1864-65.	Per Week.	Month.	4 Months.	1865-66.	Per Week.	Month.	4 Months.
JUNE	{ 12 9 32 12 —	65		JUNE	{ 25 7 11 2 —	45		JUNE	{ 2 — 5 — —	7	
JULY	{ 15 10 9 11 —	45		JULY	{ 4 5 3 5 —	17		JULY	{ 2 2 1 — —	5	
AUG.	{ 5 14 4 6 —	29	217	AUG.	{ 12 6 4 5 —	27	150	AUG.	{ 2 1 — — —	3	39
1863-64	...		980	1864-65	...	...	474	1865-66	...	...	277

Total Number during the Three Years, 1,731.

The largest number of admissions on any one day was thirteen, which occurred on March 12th, 1864, but the variations in the weekly and monthly numbers depend more upon the number of days when no admissions took place, than on the numbers on individual days. Thus in December, 1863, when the largest monthly number occurs, there were but three days without fresh cases, while in July, 1865, where the monthly number is smallest until the break of the disease in the following June, there were 17 days on which no admissions took place.

A comparison of these figures with the temperature shows a rough correspondence between them ; not that they vary in such a way that a close connexion as between cause and effect can be traced between them, but that in a general way the variations of both agree ; the increase in the number of cases corresponding with a fall in the temperature, and *vice versâ*. It would appear therefore as if in some indirect way there was a connexion ; and this will appear from the following table which shows the monthly number of cases and the monthly mean temperature.

TABLE II.—COMPARISON of the MONTHLY NUMBER of CASES,
with the MONTHLY MEAN TEMPERATURE.

—	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.
1863-64.												
Number of cases - -	29	83	91	133	115	115	118	79	78	65	45	29
Mean degree temperature	49.8	46.6	—	39.7	37.8	33.4	37.1	44.8	47.7	—	56.2	54.5
1864-65.												
Number of cases - -	50	48	32	37	46	26	36	49	61	45	17	27
Mean degree temperature	52.4	45.8	41.8	39.8	34.4	34.3	37.4	45.1	51.1	57.1	58.1	55.6
1865-66.												
Number of cases - -	38	30	33	24	28	22	34	29	24	7	5	3
Mean degree temperature	57.5	45.5	41.1	42.2	38.1	36.1	37.9	43.1	47.0	55.8	56.4	54.8

A comparison of the number of cases with the variations of the barometer yields no point of interest.

When we endeavour to investigate the details of these cases, the first thing that strikes us is the difference between the numbers of the two sexes. Throughout the whole of the disease the number of female cases exceeds considerably that of male, and this difference is most marked at the commencement of the epidemic and gradually becomes less at a later period. The exact figures may be stated thus:—

TABLE III.—COMPARISON of NUMBERS of MALE and FEMALE CASES.

—	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	TOTAL.
1863-64.													
Males -	6	40	40	53	55	47	60	28	37	28	12	12	418
Females -	23	43	57	80	60	68	58	51	41	37	33	17	562
1864-65.													
Males -	26	22	12	16	26	10	20	19	24	19	9	13	216
Females -	24	26	20	21	20	16	16	30	37	26	8	14	258
1865-66.													
Males -	15	14	17	11	14	7	17	13	6	2	2	2	120
Females -	23	16	16	13	14	15	17	16	18	5	3	1	157

Total for three years:—Males, 754; Females, 977; Total, 1,731.

It will be observed that although the proportion between male and female cases oscillates somewhat, yet the disproportion is greatest at first, and becomes less towards the close. Thus in the first year there is only one month (March, 1864) where the number of males exceeds that of females, while in the second year the same thing occurs in four months (September, 1864, January, March, and July 1865) and curiously enough one of these—March, is the same month that had witnessed a similar occurrence the preceding year. In the third year, although the number of males exceeds that of females in only two months, yet there is an equality between the numbers of the sexes in two months (one of which is again March) and the difference between them in the other months is not so great as before. The same fact may be brought out differently:—Divide the years into periods of four months each and it will be found that in the first period

the disproportion is greatest. In the four months ending December, 1863, the number of cases was, males 139, females 197, a ratio of nearly 2 to 3. If now the same ratio had been carried through, then, for the remaining periods of four months each, the number of female cases respectively being 237, 128, 91, 82, 85, 68, and 62, the number of male cases corresponding would have been 166, 89, 63, 57, 59, 47, and 43, whereas the numbers actually occurring were 190, 89, 76, 75, 65, 57 and 51. At the very close of the epidemic, again, the difference is greater than even at the commencement; the last four months yielding 27 females and 12 males or more than two to one. Contrasting the years together:—If the ratio of the first year, 418 males to 562 females, had held good in the second year, then the number of male cases corresponding to the 258 female cases would have been 209; whereas there actually occurred 216; or had the same held good the third year, the number of male cases should have been 116 instead of 120.

It is true that in the population generally there is a preponderance of females over males, but the difference here indicated is greater than can be accounted for on this ground, and therefore is to be regarded as an essential feature of the disease. This may be shown as follows:—Of the cases treated in hospital, 74 were from the country or from suburban districts. Throwing these aside, we have 1,657 cases actually from the town, of whom 708 were males and 949 females. By the census of 1861 the proportion between males and females was 32,554 males to 41,346 females. Taking this ratio, the number of females corresponding to the 708 males would be but 899 instead of 949. The difference is still more marked if we limit our attention to the parish of St. Nicholas, where, as will be afterwards mentioned, the disease seems to have chiefly raged. Of these cases in hospital, 1,414 came from this parish, of whom 607 were males and 807 females. By the census of 1861, there were in St. Nicholas 18,909 males to 23,053 females. Taking this proportion the number of females corresponding to the 607 males would be 740 instead of the 807 which actually occurred. Even in the parish of Old Machar, though the difference is not nearly so marked, it still exists. From this parish there were sent to hospital 243 cases, viz., 101 males and 142 females. By the census of 1861, the population of this parish was 13,645 males and 18,293 females, and at this rate the number of females corresponding to the 101 males would be 135, whereas there actually occurred 142.

This difference between the sexes is most marked in adults, and least in children and old people, as the following table will show, which also points out a marked difference in the number of cases as occurring at different periods of life; those under the age of 25 constituting nearly two-thirds of the whole number of cases. In this table the different ages are divided thus:—Children, or all under the age of ten; young persons from ten to twenty-five; adults (who may be regarded for the most part as heads of families) from twenty-five to fifty; and old persons, above the age of fifty. The reason for selecting these ages will be apparent when we come to consider the probable cause and cost of the epidemic.

TABLE IV.—NUMBER of CASES at DIFFERENT AGES.

AGE -		0—10		10—25		25—50		50, &c.		0-10	10-25	25-50	50 &c.	TOTAL.
SEX -		M.	F.	M.	F.	M.	F.	M.	F.					
1863.														
SEPT.	-	—	5	4	10	2	8	—	—					
OCT.	-	7	7	21	23	11	12	1	1					
NOV.	-	10	6	21	20	8	20	1	5					
DEC.	-	7	16	26	28	13	30	7	6	58	153	104	21	336
1864.														
JAN.	-	10	12	30	29	12	16	3	3					
FEB.	-	8	12	21	27	14	26	4	3					
MARCH	-	9	6	28	30	18	21	5	1					
APRIL	-	6	7	11	27	7	14	4	3	70	203	128	26	427
MAY	-	7	10	18	18	9	12	3	1					
JUNE	-	9	2	12	14	5	18	2	3					
JULY	-	5	4	1	17	5	11	1	1					
AUG.	-	9	5	2	3	1	8	—	1	51	85	69	12	217
Year 1863-4		87	92	195	246	105	196	31	28	179	441	301	59	980
1864.														
SEPT.	-	6	8	10	9	8	6	2	1					
OCT.	-	6	10	11	6	4	10	1	—					
NOV.	-	4	5	4	8	4	7	—	—					
DEC.	-	5	4	8	12	3	5	—	—	48	68	47	4	167
1865.														
JAN.	-	2	2	14	10	8	7	2	1					
FEB.	-	2	1	6	6	1	6	1	3					
MARCH	-	4	3	6	6	7	7	3	—					
APRIL	-	1	5	8	8	6	13	4	4	20	64	55	18	157
MAY	-	3	10	10	10	8	11	3	6					
JUNE	-	3	1	7	11	8	12	1	2					
JULY	-	—	1	5	4	2	2	2	1					
AUG.	-	1	2	5	6	6	5	1	1	21	58	54	17	150
Year 1864-5		37	52	94	96	65	91	20	19	89	190	156	39	474
1865.														
SEPT.	-	1	4	4	11	8	7	2	1					
OCT.	-	4	—	5	9	5	7	—	—					
NOV.	-	2	1	9	10	6	4	—	1					
DEC.	-	3	3	6	7	2	3	—	—	18	61	42	4	125
1866.														
JAN.	-	2	2	6	5	6	5	—	2					
FEB.	-	1	—	4	9	1	5	1	1					
MARCH	-	2	4	10	6	5	6	—	1					
APRIL	-	7	1	4	9	2	5	—	1	19	53	35	6	113
MAY	-	—	1	5	10	1	7	—	—					
JUNE	-	1	—	1	2	—	3	—	—					
JULY	-	—	2	1	1	1	—	—	—					
AUG.	-	—	—	1	1	1	—	—	—	4	22	13	—	39
Year 1865-6		23	18	56	80	38	52	3	7	41	136	90	10	277
3 years 1863-66.		147	162	345	422	208	339	54	54	309	767	547	108	1,731

From this table it will be apparent that the greatest number of cases occur between the ages of ten and twenty-five, the next greatest between twenty-five and fifty; then in children under ten; and least in old people over fifty. The exact proportions, however, between the numbers at these different ages seems to have varied. The eight months ending December 1864 witnessed a very large proportion of young cases, while the first eight months of 1865 were marked by an exact reversal of this. Thus in the former period the number of cases under twenty-five was to that above the same age nearly as two to one (252 and 132 respectively) while in the latter period, the numbers were nearly equal (163 and 144). It will seem that this variation has an important bearing on the ratio of mortality.

The rate of mortality has not at any time been very high, but has been marked by considerable variations, as is shown in the following table, where the deaths are entered, not according to the months in which they occurred, but according to the months in which the cases entered the hospital. The figures in this table therefore express the results of the admissions as given in table I. Thus, in September 1863, out of the 29 admissions, 3 died, as specified below, but of these three deaths two occurred in September and one in October.

TABLE V.—NUMBER of DEATHS, and RATE of MORTALITY of the MONTHLY ADMISSIONS.

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Total.
1863-64.													
No. of deaths	3	6	9	17	13	16	20	10	9	10	3	3	119
Rate per cent.	10.3	7.2	9.9	12.7	11.3	13.9	16.9	12.67	11.5	15.4	6.6	10.3	12.14
1864-65.													
No. of deaths	8	4	—	5	8	3	6	12	12	7	5	6	76
Rate per cent.	16.0	8.3	—	13.5	17.4	11.5	16.6	24.5	19.5	15.5	29.4	22.2	16.03
1865-66.													
No. of Deaths	5	4	3	2	3	4	3	3	4	—	2	—	33
Rate per cent.	13.15	13.3	9.09	8.3	10.7	18.18	8.8	10.34	16.6	—	40.0	—	11.9

Total mortality for three years 228 = 13.17 per cent.

It is noticeable here that the rate of mortality varies greatly from time to time. This variation has no connexion with external influences, such as temperature, as is shown by the circumstance that the only month prior to the subsidence of the disease, in which the cases admitted all resulted favourably (November, 1864), was one marked by a low mean temperature, 41.8° , and by the fact that the same month (July), which in 1864 produced the lowest rate of mortality, namely, 6.6 per cent., produced in 1865 and 1866 the highest rate, namely, 29.4 per cent. and 40.0 per cent., and that, although the mean temperature was nearly the same in all, namely, 56.2° , 58.1° , and 56.4° respectively. It is found, on comparing the death rate of the two sexes, that it is, for

the most part, higher in males than in females, as is apparent from the following table :—

TABLE VI.—COMPARISON OF THE DEATH RATE OF THE TWO SEXES.

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1863-64.													
Male deaths	2	3	2	8	5	7	13	5	4	4	2	—	55
Female deaths	1	3	7	9	8	9	7	5	5	6	1	3	64
Rate p. c., Male ...	33·3	7·5	5·0	15·0	9·09	14·9	21·6	17·8	10·8	14·3	16·6	—	13·15
Rate p. c., Female..	4·35	6·9	13·7	11·25	13·3	13·2	12·0	9·8	12·2	16·2	3·0	17·6	11·4
1864-65.													
Male deaths	2	1	—	3	5	1	4	4	6	2	4	5	37
Female deaths	6	3	—	2	3	2	2	8	6	5	1	1	39
Rate p. c., Male ...	7·7	4·5	—	18·7	19·2	10·0	20·0	21·0	25·0	10·5	44·4	38·5	17·1
Rate p. c., Female..	25·0	11·5	—	9·5	15·0	12·5	12·5	26·6	16·2	19·2	12·5	7·14	15·1
1865-66.													
Male deaths	3	1	3	1	2	3	1	—	—	—	1	—	15
Female deaths	2	3	—	1	1	1	2	3	4	—	1	—	18
Rate p. c., Male ...	20·0	7·14	17·6	9·09	14·28	42·8	5·88	—	—	—	50·0	—	12·5
Rate p. c., Female..	8·7	18·75	—	7·69	7·14	6·6	11·76	18·75	22·2	—	33·3	—	11·4

Total for the three years: Males 107, or 14·19 per cent. Females 121, or 12·38 per cent.

Although in most of the months where the death rate is high, the ratio of male deaths is higher than that of female, yet this is not so uniformly the case as to admit of our drawing any safe conclusion from it. The real key to the variations in the rate at different times is found in the great discrepancy at different ages. Dividing the different periods of life as before, it is found that in children the mortality is comparatively trifling; it is greater in young persons, immensely increased in adults, and very high in old people. The difference between the death rate of the sexes is now found to hold good chiefly in adults and old persons, where the male mortality exceeds the female; in children, again, the slight difference that exists is rather in favour of the male.

25-50	Deaths	M { F	1 3	... 1	... ...	3 1	3 2	... ...	2 2	2 4	4 3	1 2	2 ...	2 1	20 19
	Rate per cent.	M { F	12.5 50.0	... 10.0	... ..	100.0 20.0	37.5 28.6	... ...	28.6 28.6	33.3 30.7	50.0 27.3	12.5 16.6	100.0 ...	33.3 20.0	30.7 20.8
50, &c.	Deaths	M { F	1 ...	1 ...	... ...	... ...	1 1	1 2	2 ...	2 3	1 3	1 1	1 1	1 ...	12 11
	Rate per cent.	M { F	50.0 ...	100.0 ...	... ...	... ...	50.0 100.0	100.0 66.6	66.6 ...	50.0 75.0	33.3 50.0	100.0 50.0	50.0 100.0	100.0 ...	60.0 57.9
0-10	Deaths	M { F	...	...	...	...	...	...	...	...	...	...	...	...	...
	Rate per cent.	M { F	...	...	...	...	...	...	...	...	...	...	...	...	...
10-25	Deaths	M { F	...	...	...	...	...	...	...	...	...	...	...	...	...
	Rate per cent.	M { F	...	...	...	...	...	...	...	...	...	...	...	...	...
25-50	Deaths	M { F	1 2	1 2	3 ...	1 ...	2 ...	1 ...	1 1	...	...	...	1 ...	...	11 10
	Rate per cent.	M { F	12.5 28.57	20.0 28.57	50.0 ...	33.3 ...	...	100.0 16.6	20.0 16.6	...	...	...	100.0 ...	...	28.9 19.2
50, &c.	Deaths	M { F	2 ...	... ...	... ...	... ...	... ...	1 1	...	...	...	...	...	...	3 2
	Rate per cent.	M { F	100.0 ...	... ...	... ...	... ...	... ...	100.0 100.0	...	...	...	...	...	...	100.0 28.57

This detailed table shows the uniformity that marks the material difference of risk at various periods of life, the mortality increasing with the age, but the following summary may perhaps put it more clearly :—

ABSTRACT OF TABLE VII.

AGE - -	0—10		10—25		25—50		50, &c.	
	M.	F.	M.	F.	M.	F.	M.	F.
No. of deaths -	1	8	12	18	57	70	37	25
Rate per cent. -	0.68	4.9	3.47	4.26	27.4	20.6	68.5	46.3

Omitting altogether the distinction between the sexes, the figures would stand thus for the three years :—

AGE - - -	0—10	10—25	25—50	50, &c.
Number admitted - -	309	767	547	108
Number of deaths - -	9	30	127	62
Rate per cent. - - -	2.9	3.9	23.2	57.4

The length of time during which the patients were in hospital is a point of interest, as affording a means of estimating the duration of the disease. The great bulk of the cases had been a few days ill before admission, while, on the other hand, they remained in hospital some time after convalescence was fairly established, or until the strength was sufficiently restored to enable them to resume their occupations on leaving. The average time in hospital may, therefore, by balancing these two opposite errors against each other, be taken as probably three or four days in excess of the actual duration of the disease. In cases resulting favourably the average time is found to be 27.9 days, or, deducting the cases of prolonged stay in hospital, arising mostly from the supervening of other diseases or complications not connected with the fever, 25.4 days, or, say three weeks and a half. Deducting the half week as the probable excess, as mentioned above, a period of three weeks would be indicated as the ordinary run of the disease. As it is impossible in very many cases to put reliance on the statements of patients or their friends with reference to the actual date of the commencement of the disease, this is as near an approximation as can be come to on this point, and is in all probability so near the truth that it may practically be accepted as correct.

As the number of cases continuing in hospital during different times varies but little in proportion from month to month, it seems unnecessary to give a detailed statement ; I therefore annex simply a summary for the three years :—

TABLE VIII.—TIME IN HOSPITAL OF CASES TERMINATING FAVOURABLY.

Time in Weeks.	1 week.	2 weeks.	3 weeks.	4 weeks.	5 weeks.	6 wks.	7 wks.	Up-wds.	Lowest No. days	Highest No. days	Average days.
No. of cases. }	28	138	365	385	256	136	81	95	3	123	27.9

The time in hospital of those cases that terminated fatally, presents a marked contrast to the proceeding. More than half of these were fatal within the first week, and five-sixths of the whole within the first fortnight; about a sixth of the whole being moribund or almost so on admission, and dying within three days. The great majority of those dying early had been ill a week or ten days before admission, so that probably almost all those dying within the fortnight should be classed together as being about the same length of time ill, and would assign from the tenth to the fourteenth day of the disease as the period of greatest danger, or that in which the greatest number of deaths occurred. Deducting the prolonged cases, chiefly those of complications, the average duration would be 7.2 days. For the same reason as in the last I content myself with giving a summary of the three years:—

TABLE IX.—TIME IN HOSPITAL OF CASES TERMINATING FATALLY.

Time	1 week	2 weeks.	3 weeks.	4 weeks.	5 weeks.	6 wks.	7 wks.	above 7 wks.	Lowest No. days	Highest No. days	Average Days.
No. of cases. }	129	64	16	8	5	3	1	2	—	90	9.4

The average time of all (both cures and deaths) was 25.4 days.

A consideration of the localities affected, and of the run of the disease, shows that it did not break out and spread indiscriminately over the town, but appeared in different places in succession, continuing in each a varying time, apparently regulated more by the density of the population than by anything else, and then dying out, sometimes to re-appear after a time in different houses in the same street, and sometimes, again, not to return; this last being specially the case in localities where a few houses are closely packed together, over which it generally spread at once. It frequently happened, however, that the emptying or partial emptying of an affected house at the beginning, checked the disease, which then either did not recur at all, or recurred only after the return from the hospital of those cases sent there, had set up anew the former condition as to crowding. In some places, however, the disease continued nearly uniformly from beginning to end of the epidemic. The chief of these might be mentioned as Gallowgate where it was present during the whole three years, and which furnished nearly one-eighth of all the

cases from St. Nicholas parish ; Causeway End where it lasted two years ; and Berry Lane where three distinct outbreaks occurred—one in the winter of each year. These streets, as far as position is concerned, are well placed ; but they are the seats of a closely packed population, especially Gallowgate, which lies high, and occupies the crest of a ridge having slopes on three sides ; yet it has opening off it a large number of short closely-built courts, whereby the salubrity which its situation might have given it, is entirely destroyed.

In endeavouring to solve the problem of what is the cause of typhus, we may premise the following general considerations:—An epidemic disease may be either one imported into a country, and spread by certain favouring circumstances, as contagion or peculiar states of the atmosphere, or it may arise spontaneously in the place where it rages. In the former case its occurrence will be traceable to the direct introduction of cases of the disease ; it will spread from them rapidly over the place, attacking first the weak, and then the strong, and marked by a high relative mortality at first, gradually becoming less as the disease becomes spent, or as—the weak having been cut off—it becomes limited to those who are strong enough in a measure to resist it. Such a disease will not last long, inasmuch as when once checked by a change in the atmospheric condition (as from heat to cold or *vice versâ*) there exists no local cause to renew it, whereas an epidemic from local causes will continue until all liable to it and within its influence are attacked, varying only in intensity according as the atmospheric conditions are favourable or otherwise to its spread, but always capable of being renewed as long as the local cause is present. A consideration of the phenomena presented by the typhus epidemic shows that the former description is not applicable to it. There was no reason to suspect its introduction from without ; the rate of mortality remained throughout nearly the same ; and although in each year it yielded to the heat of summer, yet it recurred again with the cold of winter, and continued until (as will be seen there is reason to believe) it had gone over most of those liable to it. It is therefore to a local cause that we must look for its origin ; and this might be supposed to be either external to the houses or within them. The former would point to such conditions as the accumulation of filth and rubbish about the houses, deficient drainage and the like, whereby the population is exposed to the vapours arising from decaying animal and vegetable matters ; while the latter would especially indicate overcrowding, and the consequent exposure in an excessive degree to the exhalations from the bodies of living individuals. If the former were the cause, the following are what would be expected as the prominent characteristics. It would be most intense in summer and autumn when decay and putrefaction go on most rapidly, and eliminate most quickly their dangerous gases ; it would not be limited to one house in a street, but would extend to all subjected to the same external influence, and it would affect chiefly the low lying and therefore dirtiest streets. These characters were not those that marked the typhus epidemic. It was most

intense in the coldest weather ; it frequently attacked a single house in a street, going over most of the inmates, but not spreading to the surrounding houses ; it was not especially the low lying and dirty, but the most crowded streets that it chiefly attacked and remained longest in, and the rapid thinning of the population of a house by the removal at once of several of the inmates had frequently the effect of stopping its spread. It follows, therefore, that the probable cause lies not external to the houses but within them, and, if it can be shown that the theory of overcrowding as a cause will account for the phenomena presented by the disease, it would seem probable that this is the true explanation of its origin. The following may be taken as a summary of the facts elicited :—The disease is most intense in cold weather, and least so in warm ; it attacks females and children in a greater proportion than males ; it attacks young persons in a greater proportion than old ; it is more dangerous in old than in young—in males than in females ; it is contagious ; and, what are probably to be regarded simply as specialities of the disease, it attacks individuals as a rule but once ; its attack lasts three weeks, and is most dangerous during the second week. Adopting the theory of overcrowding as the cause, the following would be the probable explanation :—In winter the population is much more kept in doors than in summer, and doors and windows are more carefully closed, so that the injurious influence of overcrowding is much more felt then, and the variations of temperature will in this manner act directly either in increasing or mitigating the evil. Further, women and children being those of the inmates of a house that are most constantly and continuously in it, it will be on them that the mischief will in the first place and chiefly fall, and therefore a larger number of them than of males are attacked. The difference in mortality is probably due to the circumstance that when young persons are attacked, they are at once put under treatment or at least allowed to rest ; while adults, especially heads of families, struggle on for some time after the disease has begun, being unwilling, for the sake of those dependent on them, to give up work until the advance of the disease compels them to do so, and by this means the strength is exhausted early in the disease, and the chance of recovery materially impaired. In old persons, in addition to this, there is the circumstance that it rarely happens that an advanced age is attained without some of the organs of the body being impaired in function, or actually diseased, and, therefore, the system is less able to withstand a debilitating disease, such as typhus, than when these are intact. As to contagion it is intelligible enough that if the exhalations from the lungs and skin of healthy individuals are sufficient, if accumulated in quantity by overcrowding to induce such a disease, much more will the exhalations from patients labouring under the disease suffice to spread it ; but as in the case of its origin the proper dilution of these with pure air as when the inmates of a house are in number reduced within a proper limit does away with any injurious result, so in the case of its spread, their dilution by thorough ventilation renders them in-

nocuous. It may be said that if typhus is the result of overcrowding, why is it not constantly present in our towns? The explanation of this seems to lie in its attacking an individual but once, so that if an epidemic spread over all the inhabitants of a town liable to it, it then necessarily ceases from want of material, and will not again recur until ten or fifteen years after, when a new generation that has not gone through it has sprung up.

The facts now adduced, and the conclusions based upon, them are derived from the absolutely reliable data of the hospital statistics; but the following attempt to estimate the total extent of the disease is, although the nearest that can be obtained, only an approximation to the truth. There is every reason to believe that the mortality throughout the town generally has not been proportionately higher than that within the hospital; very probably it may have been less, inasmuch as the hospital cases, being drawn from the poorest and therefore the worst fed and worst clothed class in town, would include many fatal ones which might have resulted differently had they been better cared for previously; and also as the removal of bad cases at a late stage of the disease is decidedly injurious, and therefore by increasing the danger helps to swell the hospital mortality. But assuming that the rate generally is the same as that in hospital (which will rather understate than overstate the result) and taking the number of deaths for the three years as given in the reports of the Registrar-General, the following is the estimate:—

Number of cases in hospital during three years	. 1,731
Number of deaths amongst these	228
Or at the rate of 13·17 per cent.	
Total number of deaths in Aberdeen from typhus for three years	610
Corresponding number of cases at the rate of 13·17 per cent	4,631

This estimate, for the reasons given, is probably under the actual number. The population of the town by the census of 1861 was 73,900. Taking 74,000 as the number, the proportion of cases would be 1 in every 15·9 individuals. The increase of population for the ten years 1851 to 1861 was scarcely 2,000. If we allow an increase of 1,100 as that from 1861 to 1866, the proportion would be 1 in every 16·2 individuals, or 6·17 per cent. of the population attacked.

The disease, however, has fallen very unequally on different parts of the town. The town is divided into two registration districts, corresponding nearly with the parishes of Old Machar and St. Nicholas; of these the former is chiefly the residence of the wealthier classes, and the latter of the working population. The number of deaths in St. Nicholas, exclusive of those in hospital, was 256; to this add the number of fatal cases in hospital from that district, 188, and the total number would be 444. The population of St. Nicholas by last census was 41,962, and the number of typhus cases corresponding to the deaths (calculated as above) would be 3,339, or 1 in every 12·56 of the population. The deaths in Old Machar were 126, to which add

the fatal hospital cases from that district, 31, and the total deaths would be 157. This would correspond (calculating the mortality as in hospital) to 1,231 cases, or (the population by last census being 31,938) 1 in every 25·9 of the population, or scarcely half that of St. Nicholas.

In endeavouring to form an estimate, necessarily but an imperfect one, of the cost to the community of such a disease, the following would appear to be the principal items:—

First. Expense of treatment. This, including medicines, wine, attendance, &c., can scarcely be estimated at a lower figure than five shillings per week for each individual; and taking the average stay in hospital as representing the average duration of the disease, the treatment of each case would extend over twenty-five and a half days.

Second. Loss to the community from the want of the services of those affected by the disease. To estimate this we may exclude children under ten years of age, and presume that all the others are by their labour remunerative in some form or other to the community. There will of course be a considerable variation in the value of these, but, taken overhead, the whole may be represented by an average of ten shillings per week, extending as before to twenty-five and a half days.

Third. Loss to the community by the death of heads of families. Those who have families dependent on them may be fairly represented by the number between the ages of twenty-five and fifty. The total of male deaths in hospital between these ages was sixty-nine, and, calculating the proportion for the whole town as before, the probable total number will be one hundred and eighty-four. The total of female deaths in hospital between these ages was eighty-eight, and this, calculated as before, would give two hundred and thirty-five as the corresponding deaths for the whole town. Each of these may be supposed to have had a fair chance of ten years of industrial life but for this disease, and the loss of their labour during this time must be regarded as so much loss to the community. Perhaps the estimate, taken above, of ten shillings per week, might not be too high, but say that one half of this rate, or thirteen pounds per annum, be taken as the estimate for the males, and one half of this again, or six pounds ten shillings per annum, for the females.

Fourth. Loss to the community by the death of children and young persons. The number of deaths in this class amounted to fifty-one, and we may suppose that half of these might have attained to years of maturity, with a prospect of, say, twenty years of industrial life, when their labour would be profitable to the community. The value of this may be estimated on the same principle as that of adults, and on the presumption that the number would be equally divided between the sexes. This item is certainly the most problematical, and might have been omitted, but as it forms only a small one of the whole, it has been allowed to stand.

On the above plan, the following would be the calculation :—

	£	s.	d.
Treatment of 4,631 cases, for $25\frac{1}{2}$ days, at 5s. per week - - - - -	4,217	10	0
Loss of labour for $25\frac{1}{2}$ days of 3,804 individuals (excluding children) at 10s. per week -	6,928	14	0
Loss by adult deaths :			
Value of labour of 184 males, at £13 per annum, for 10 years - - - - -	23,920	0	0
Value of labour of 235 females, at £6 10s. per annum, for 10 years - - - - -	15,275	0	0
Loss by deaths of 51 children and young persons, allowing one half to die before attaining adult life, viz. :			
Value of labour of 12 males, for 20 years, at £13 per annum - - - - -	3,120		
	4,680	0	0
Value of labour of 12 females, for 20 years, at £6 10s. per annum - - - - -	1,560	0	0
Probable cost of the epidemic -	£56,581	4	0
	<u>65,021</u>		

This estimate is at the best but a very rough approximation, but the whole has been kept down to the lowest figure, so that the result is in all probability understated, and yet the amount is a high one, equal, in fact, to a tax on the inhabitants of something over 15s. per head. If, then, such has been the cost in a small and comparatively healthy town like Aberdeen, what must it have been in the larger towns where this epidemic has been raging, and in many of which the rate of mortality has been higher, and, if the conclusions come to as to the probable cause are correct, it follows that the whole of this waste of human life might have been prevented.

