

SOME NOTES ON PNEUMONIA STATISTICS IN GLASGOW WITH SPECIAL REFERENCE TO CHILDREN UNDER FIVE YEARS OF AGE.

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(With 2 Charts.)

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INTRODUCTION.

AFFECTIONS of the respiratory system assume first place among causes of death in young children. This group of diseases which includes the acute primary pneumonias and the secondary pneumonias which follow measles and whooping cough has been subjected to much study. The following account represents a preliminary study of the pneumonias in children undertaken in order to ascertain how far reliable data could be obtained from notification and death statistics.

HAS NOTIFICATION HAD ANY EFFECT ON THE MORTALITY FROM PNEUMONIA?

Since pneumonia became notifiable an increasing number of cases have been removed to hospital in Glasgow, and it was deemed advisable to discover if this procedure had had any effect on the mortality of the disease¹. In Table I are shown the pneumonia death rates for all ages, together with the percentage of notified cases admitted to Corporation Hospitals and also the pneumonia death rates for children under five years.

In reading the figures shown in the column headed "Percentage notified cases isolated in Corporation Hospitals," it has to be borne in mind first, that the notification figures, as will be shown later, fall short of the real incidence

¹ Pittsburgh's first year's experience of quarantine regulations showed a reduction of 245 deaths from pneumonia, as compared with the previous year and it was believed that this was partly due to the attempt at pneumonia control.

Table I. *Pneumonia death rates in Glasgow for all ages and for children under five years and the percentage of notified cases isolated in Corporation Hospitals.*

Year	Pneumonia death rate	Percentage notified cases	Pneumonia death rate
	per million. All ages	isolated in Corporation Hospitals	per million children under five years
1914	1470	—	—
1915	1882	—	—
1916	1363	—	—
1917	1368	—	—
1918	2046	—	—
1919	1918	—	—
*1920	1748	38	—
1921	1372	46	6,284
1922	2129	43	12,449
1923	1285	60	5,536
1924	2006	54	10,630
1925	1517	59	7,545
1926	1596	55	8,082

* First complete year of notification.

of pneumonia and secondly that a considerable number of cases are also sent to General and Parish Hospitals. From the information contained in Table I, it is seen that as far as Glasgow is concerned notification and isolation, to the extent shown, have not so far effected a reduction in the death rate of pneumonia.

INCOMPLETENESS OF THE FIGURES SUPPLIED BY NOTIFICATION.

It is well known that the notifications of pneumonia do not reveal the true incidence of the disease. The actual extent to which patients are notified can only be estimated indirectly and an effort is made to do this by means of the data shown in Table II.

Table II. *Pneumonia in Glasgow. All ages.*

To show the death rate per 100 notified cases.

	Notified	Died	Deaths per 100 notifications
1920	4533	1949	43
1921	3592	1475	41
1922	6572	2303	35
1923	4465	1400	31
1924	7272	2198	30
1925	6105	1665	27
1926	6689	1758	26

In this table the notifications and deaths since 1920—the year following the introduction of compulsory notification—are placed side by side along with the rates which one set of figures bears to the other. During this period the notifications have considerably increased and the mortality rate has fallen correspondingly from 43 to 26 per cent., from which it is clear that the discrepancy between the numbers notified and the true incidence of acute primary pneumonia is being rapidly diminished. If we could estimate what is the fatality rate of acute pneumonia—both lobar and broncho-pneumonia, in hospital cases as well as in cases treated at home—we should be able from

the number of deaths to calculate approximately the incidence of the disease. The estimation of the fatality rate of acute pneumonia is rendered difficult by the fact that in no extensive series of cases treated at home in this country has the rate been calculated. As regards lobar pneumonia Major Greenwood and R. H. Candy¹, in a thorough investigation of a century and a half's statistics in the London Hospital, have shown that the hospital fatality rate varied little from 1854 to 1903—the last 50 years of the period reviewed. In these years 19·5 per cent. is the average case mortality. From a series of 3471 male cases of lobar pneumonia treated at home in Leipzig they quote the average fatality rate as 14·4, and from a series of 1039 home cases investigated by the Collective Investigation Committee of the British Medical Association, they give 17·9 as the average death rate. It is pointed out by these workers that the lower fatality rate among patients not treated in hospital is perhaps due to "differences in social class." The average fatality rate among all pneumonia patients treated in infectious diseases hospitals in Glasgow, from 1919–1925, was 21·8: there were 12,517 patients and 2727 deaths. The death rate among pneumonia cases in Glasgow not treated in hospital, will, as has been shown, be almost certainly lower than 21·8, but for the purposes of this paper we intend to assume that the fatality rate for all cases in Glasgow is 20 per cent.²; this figure is probably too high, and as a result the incidence of pneumonia calculated from it will be under-estimated. If this figure be applied to the Glasgow data for the year 1926, the number of notifications corresponding to a mortality rate of 20 per cent. would have been 8790, instead of 6689, which means that on this basis the number of cases notified last year may be taken to represent about 76 per cent. of the total which occurred in the city. This is a great improvement on the experience of previous years; for example, applying the same argument to the figures for 1920 only about half of the total cases of pneumonia were notified.

It might be objected, however, that the reduction in the death rate per 100 notified cases is not due entirely to an increase in the numbers notified but that the actual pneumonia case mortality in Glasgow has possibly been reduced.

From hospital statistics of pneumonia, as is shown in Table III, it will be seen that there has been no reduction in the case mortality. Belvidere and Ruchill are the two hospitals which between them receive about 75 per cent. of the pneumonia cases treated by the Corporation.

The figures in Table III demonstrate that while the case mortality varies from 20·2 to 27·2 there has been no reduction in the mortality from 1920 to 1926. Accordingly it is justifiable to infer that the reduction in the pneumonia death rate per 100 notified cases is due to an increase in the number of cases notified.

¹ *J. Roy. Statist. Soc.* 74, 365–397.

² The average case mortality rate among 465,000 cases collected from literature by Wells is 20·4 per cent. (*Seventh Ann. Report Scottish Board of Health*, 1925, p. 87).

The most satisfactory reason for this improvement is probably that the main purpose in the mind of the medical attendant in notifying is not, as in the case of other notifiable diseases, to have the patient removed in order to lessen the spread of infection, but to ensure that the patient receives hospital treatment. Since 1920, the Corporation has year by year increased the hospital accommodation available for treatment of pneumonia, and this is very probably one of the reasons why the notifications have improved.

Table III. *Case mortality of acute primary pneumonia and broncho-pneumonia in Glasgow, June, 1919, to December, 1926, from the returns of Belvidere and Ruchill Hospitals.*

	Belvidere			Ruchill			Both		
	Cases	Deaths	Case mortality	Cases	Deaths	Case mortality	Cases	Deaths	Case mortality
June 1st, 1919, to May 31st, 1920	445	99	22.2	205	41	20.0	650	140	21.5
June 1st, 1920, to May 31st, 1921	328	90	27.4	440	98	22.3	768	188	24.4
June 1st, 1921, to May 31st, 1922	678	165	24.3	640	193	30.1	1318	358	27.2
June 1st, 1922, to May 31st, 1923	892	191	21.4	685	149	21.9	1577	340	21.6
June 1st to Dec. 31st, 1923	530	121	22.8	312	88	28.2	842	209	24.8
1924	1077	237	22.0	1284	261	20.3	2361	498	21.0
1925	1198	252	21.0	1186	233	19.6	2404	485	20.2
1926	1274	278	21.8	1072	228	21.2	2346	506	21.6

It has been stated in Table I that the proportion of notified cases of pneumonia admitted to Corporation Hospitals has reached the high figure of almost 60 per cent. and it may be added that in the middle of December, 1926, no less than 595 beds in the various institutions were occupied by pneumonia patients.

A survey of the notifications of pneumonia in England and Wales reveals the fact that as in Glasgow better notification is now being obtained than in former years. In the years 1920 and 1921, notifications of pneumonia numbered 38,685 and 33,744 respectively, which is to be compared with the years 1925 and 1926, when the notifications had increased to 55,876 and 50,926. If the weekly notifications of pneumonia in December, 1927, be compared with those of December, 1926, it is seen that the more recent figures are again greater: from mortality returns and other sources it is known that the increase is due to improved notification.

This discrepancy between the number of cases notified and the real incidence of the disease considerably qualifies the value of notifications for statistical purposes. Comparisons of one year with another have already been shown to be impossible and it may be pointed out that comparisons in the same year between different kinds of City Wards are also impossible, since in the poorer wards, practically all cases being sent to hospital for treatment,

a higher proportion of cases are notified, as compared with the residential wards.

Since the figures supplied by notification of pneumonia have been shown to be of limited value it is apparent that in any investigation of a statistical nature the mortality returns must be employed.

EFFECT OF ENVIRONMENT UPON THE MORTALITY FROM PNEUMONIA.

It was deemed advisable to ascertain by means of the mortality returns what influence, if any, environment exerted upon pneumonia. For this purpose an analysis of the mortality from pneumonia in children under five years of age from 1921–1926 was made. The figures were taken out in three age periods 0–1, 1–2 and 2–5 and in City Wards. The City Wards were further classified into four groups on the basis of the infant mortality rates over a period of four years (1921–1924)¹. It was thought that this basis would give a fairly accurate reflex of the general sociological condition in the four groups of wards.

The first group of City Wards comprises those wards with an infant mortality rate between 40 and 65 for the years 1921–1924: these are purely residential wards. The second group of wards, which are residential and industrial, had infant mortality rates between 65 and 100: rates between 100 and 120 characterised the third group of wards which are mainly industrial. In the fourth group, which is composed of industrial and poor wards, infant mortality rates between 120 and 140 were found.

Table IV shows the pneumonia death rate per 1000 for each group of wards for children under five years.

Table IV. *Death rate per 1000 from acute primary pneumonia and broncho-pneumonia in children under five years in Glasgow.*

	Group I Residential wards. Infant mor- tality rate 40–65	Group II Residential and industrial wards. Infant mor- tality rate 65–100	Group III Mainly industrial wards. Infant mor- tality rate 100–120	Group IV Industrial and poor wards. Rates 120–140	City
1921	1.82	4.47	6.07	8.38	6.28
1922	3.90	9.13	12.32	16.12	12.44
1923	1.14	3.40	5.41	7.72	5.53
1924	2.67	6.57	11.33	13.84	10.63
1925	2.20	4.40	8.12	9.84	7.54
1926	2.40	4.93	9.54	9.61	8.08

Table IV demonstrates the gradations in pneumonia mortality which occur in the four groups of wards. In the worst group of wards the mortality is from 4 to almost 7 times that which obtains in the best group.

The variations which occur in pneumonia mortality for the whole city demand notice. The highest rate, 12.44 per 1000, which took place in 1922, is more than double 5.53, which was the rate that occurred in the following

¹ This classification is borrowed from *Ann. Report Med. Officer of Health, Glasgow, 1925.*

year. More will be said on this later, but it can be stated here that these variations are closely related to the prevalence of measles.

It will, of course, be pointed out that as the basis of selection of wards is infant mortality rates, and as pneumonia mortality is a very important constituent of this rate, such results as were found were bound to occur. We have worked out the proportion of respiratory diseases—which include at least 80 per cent. of deaths from pneumonia—to all other causes of infant mortality for the years 1923 and 1924 in Glasgow, and found the figures to be respectively 21 and 29 per cent., so that pneumonia mortality must be considered an important factor in the infant mortality rate.

To meet this criticism Table V is inserted showing Table IV analysed into three age periods 0-1, 1-2 and 2-5 years. It is seen that in the age period 1-2 years practically the same gradations exist in pneumonia mortality from Group I to Group IV as are found in the 0-1 year age period. In the age period 2-5 years the gradations from Group I to Group IV are still present but not so marked as in the younger age groups.

Table V. *Death rates per 1000 from acute primary pneumonia and broncho-pneumonia in children under five years, analysed into groups of City Wards and age periods 0-1, 1-2 and 2-5.*

	Years	Group I	Group II	Group III	Group IV	City
1921	0-1	3.68	11.52	12.99	17.84	13.80
	1-2	2.98	5.01	8.17	12.22	8.62
	2-5	0.46	1.10	2.01	1.49	1.51
1922	0-1	11.24	20.44	30.52	35.81	29.00
	1-2	3.92	15.84	19.24	26.91	20.26
	2-5	1.23	2.48	3.16	4.96	3.55
1923	0-1	4.02	9.88	13.61	19.50	14.35
	1-2	0.58	4.54	10.49	13.74	9.67
	2-5	0.38	0.89	1.05	1.87	1.27
1924	0-1	6.89	17.94	29.78	37.88	28.62
	1-2	3.65	9.85	22.18	23.25	18.63
	2-5	1.11	2.19	2.52	3.82	2.83
1925	0-1	4.28	15.48	23.45	26.71	21.59
	1-2	5.21	3.73	13.68	17.18	12.25
	2-5	0.59	1.00	1.43	2.12	1.53
1926	0-1	9.53	14.55	26.41	25.12	22.21
	1-2	1.91	4.93	14.55	16.42	12.30
	2-5	0.21	1.76	2.32	2.27	2.03

From the data in Table V it would appear that there are factors present in the industrial and poor quarters of a large city, which are responsible for an increased mortality of pneumonia in children under five years of age.

Precisely what these factors may be has not yet been clearly elicited. There are, however, two main lines of investigation which have been brought to bear on this problem, both of which are to some extent supported by scientific experimental evidence:

(a) The important work of Leonard Hill¹ suggests that the principal factor in influencing the prevalence and mortality from respiratory diseases is asso-

¹ *Med. Res. Committee, Special Report Series, No. 32.*

ciated with the conditions of ventilation obtaining in small, ill-designed and congested tenement houses. According to this view these diseases may be "the result of indoor life, of moist heated atmospheres and massive infection from carriers."

(b) The experimental work on animals by Cramer¹, Mellanby² and others suggests that the problem of susceptibility to respiratory affections is one into which nutritional factors may largely enter, in particular where there is a vitamine deficiency in the diet.

Both of these factors may well operate in determining the prevalence of pneumonia under the conditions described, but further study is required in order to ascertain what part each plays in the causation of acute respiratory affections. The effects of the removal of poor children to rehousing schemes, where the conditions of ventilation will be improved and the diet remain unaltered, should be watched with interest.

Miss Hilda M. Woods³ found similar results by correlating pneumonia death rates in the age groups, under five years, 45-64 and 65-74 years for the triennium 1921-1923 in 82 County Boroughs in England and Wales, with several factors which were taken as indices of environment. There were (a) infant mortality rates; (b) overcrowding; and (c) number of pawnbrokers and moneylenders per 1000 occupied males. The same worker also studied the correlation between mean temperature and pneumonia deaths in London. Her conclusions are that mortality from pneumonia in young children depends more on social and environmental conditions than upon temperature.

The inference which it is justifiable to infer from the data contained in Table V—namely, the increased mortality from pneumonia in children under five years in the poorer wards of a large city—is also applicable to the secondary pneumonias which follow measles and whooping cough, for as will be demonstrated in the following section the mortality returns of primary pneumonia and broncho-pneumonia in children under five years include a varying proportion of these secondary pneumonias.

EFFECT OF MEASLES AND WHOOPING COUGH UPON THE MORTALITY RETURNS FROM PNEUMONIA.

Measles and Whooping Cough. It was considered that during epidemics of measles, many cases of secondary broncho-pneumonia would be first seen when the rash had completely faded and that accordingly a number of cases would be certified as having died of broncho-pneumonia, no mention of measles being made on the death certificate. Similarly, in the case of whooping cough, as the whoop frequently disappears on the onset of a pneumonic complication, a like error in certification might be made. One method of testing this suggestion was to chart together the mortality in children under five in respect of primary pneumonia and broncho-pneumonia,

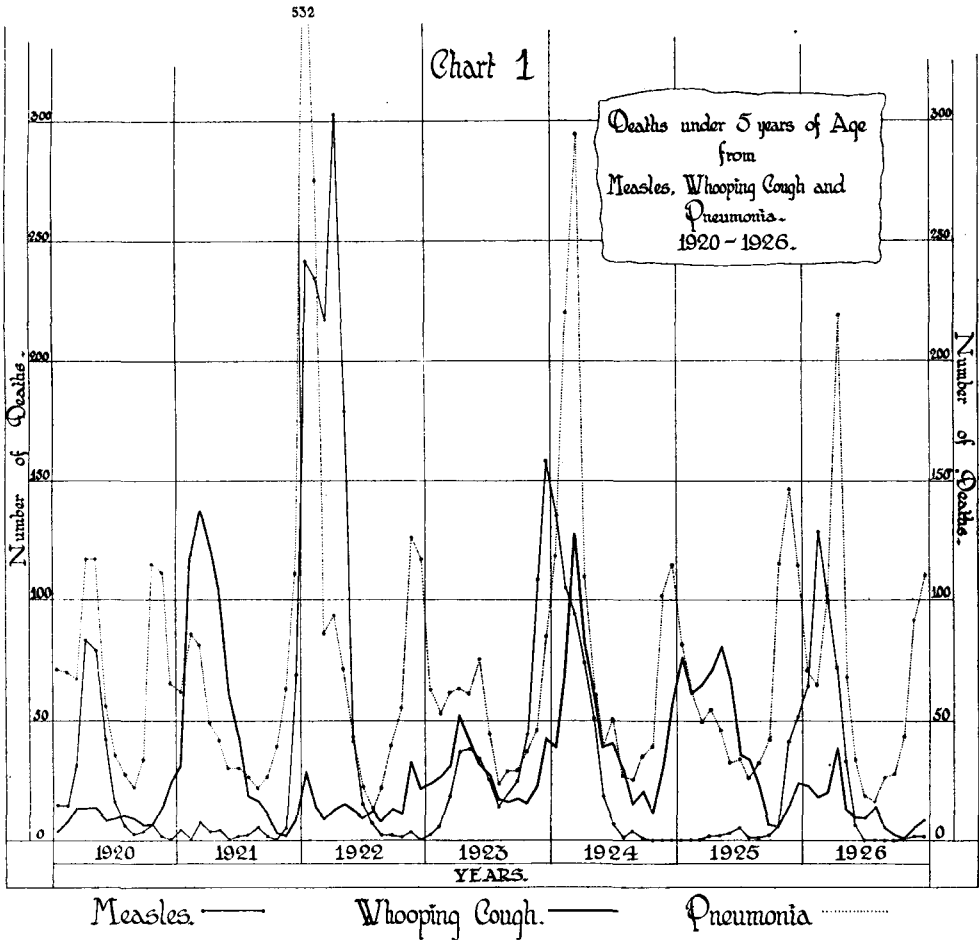
¹ *Lancet*, 8 Oct. 1927.

² *J. Hygiene* (1927), 26, 36-43.

³ *Brit. Med. J.* (1926), i, 578.

measles and whooping cough. This was done for the years 1920 to 1926, and the result is seen in Chart 1.

A close study of the curve for each disease reveals the fact that when measles or whooping cough is characterised by an unusually high mortality, pneumonia mortality is also invariably increased. The measles winter epidemic 1921-22, by far the most severe epidemic in the period reviewed, is accompanied by the highest mortality from pneumonia in the years con-



sidered. Similarly, when epidemics of measles and whooping cough occurred together as they did in the winter of 1923-24, the mortality from pneumonia reached its second highest point.

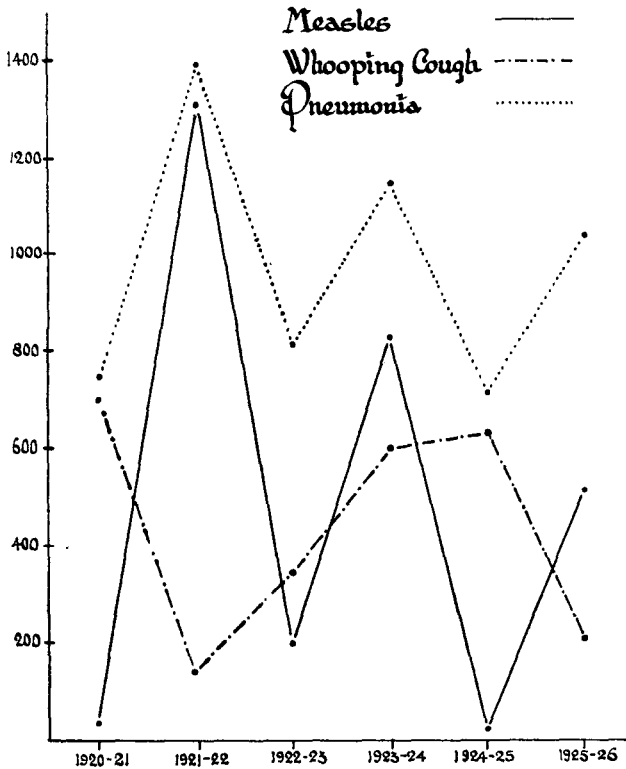
This relationship is demonstrated still better by a second chart for which I am indebted to Mr J. J. C. Ritchie, Statistical Clerk of the Department. The figures for each disease have been summed from the 37th week of the one year to the 36th week of the following year: the reason for beginning at the 37th week is that almost invariably at this week these diseases begin to

show their winter prevalence. Chart 2 shows the close relationship that exists between pneumonia and measles and it is possibly the preponderating influence of measles in this respect that accounts for the fact that the whooping cough curve does not follow the pneumonia curve.

These considerations show how difficult it is to study the primary and secondary pneumonias separately.

Chart 2

Deaths under 5 years from 37th to 36th week for the years 1920 to 1926.



There are some other possibilities to be studied in connection with Chart 1. It might be asserted that erroneous certification does not account for the influence of measles and whooping cough mortality upon pneumonia mortality returns but that, for example, the conditions which favour an increased mortality from measles or whooping cough are the selfsame conditions which favour increased mortality from pneumonia. A further suggestion made is

that epidemic diseases of childhood, such as measles and whooping cough, are followed for some time after convalescence by a period of diminished vitality, characterised by an increased predisposition to contract pneumonia. That this suggestion is true cannot be established by a survey of the chart, although it is recognised clinically that a predisposition to develop pneumonia is occasionally left after measles and whooping cough. Those cases of pneumonia that develop during the period of debility following an attack of measles or whooping cough might be termed "late" pneumonias to distinguish them from pneumonias which are complications of measles or whooping cough. The reason why no evidence of these "late" pneumonias is shown in Chart 1 is that compared with other factors charted they are probably too small in numbers to be demonstrated in a chart of this nature.

The monthly mortality from (a) bronchitis and pneumonia together, (b) whooping cough and (c) measles were similarly charted over a much longer period—1855–1915—but it must be said that evidence of the same nature as was shown in Chart 1—namely, the effect of measles and whooping cough mortality in increasing the pneumonia mortality rates of children under five years—was not quite so apparent. In explanation of this fact we would suggest the following reasons:

(a) Until after about 1875 the term broncho-pneumonia as now used was practically unknown, the term bronchitis being used in its place.

(b) It was not the invariable rule, as it is now, for practitioners to certify the primary cause of death when this was apparent: there appears to have been a practice of knowingly certifying the secondary cause in place of the primary, *e.g.* broncho-pneumonia in place of measles.

ALTERATION IN STYLE OF NOMENCLATURE OF RESPIRATORY DISEASES.

Matthew Young (1924)¹ remarks that "there has been a transference of cases from bronchitis to pneumonia in recent years in accordance with change of fashion of diagnosis." It was thought that it would be worth while to enquire to what extent this had taken place in Glasgow, and Table VI shows from 1855–1926 the number of deaths from bronchitis to every 100 deaths from pneumonia. The results are interesting. From a proportion of 94 bronchitis deaths to 100 pneumonia deaths in 1855, we note a gradual rise in the proportion of bronchitis deaths to reach a maximum of 412 in 1870, from which year until the low level of 15 in 1926 is reached, there is a steady decline.

What are the causes of this change? It is, undoubtedly, due to a change in nomenclature brought about largely by the progress of pathology. We consulted some of the standard works and text-books of medicine published from 1843 to 1878. Sir Thomas Watson in his *Lectures on Principles and Practice of Physic* (1843) uses the term pneumonia to cover both lobar and broncho-pneumonia. He shows that at this date there was no clear-cut conception of lobar pneumonia as it is now known, as distinguished from secondary

¹ *J. Hygiene*, 23, 151.

*Pneumonia Statistics in Glasgow*Table VI. *Deaths from pneumonia and bronchitis.*

Proportion of bronchitis deaths to pneumonia deaths in Glasgow for both sexes under five years.

Year	Bronchitis	Pneumonia	Proportion of bronchitis deaths to 100 pneumonia deaths	Year	Bronchitis	Pneumonia	Proportion of bronchitis deaths to 100 pneumonia deaths
1855	359	383	94	1890	612	572	107
6	363	404	90	1	657	590	111
7	385	373	103	2	671	702	96
8	582	447	130	3	597	744	80
9	389	315	123	4	471	569	83
1860	1015	492	204	5	647	833	78
1	909	340	267	6	475	603	79
2	985	291	338	7	556	852	65
3	1009	390	259	8	477	810	59
4	1055	383	275	9	473	733	65
5	1043	351	297	1900	552	892	62
6	1046	330	317	1	444	770	58
7	1084	305	352	2	483	756	65
8	1168	307	380	3	479	920	52
9	1532	442	347	4	500	1006	50
1870	1114	270	412	5	379	938	41
1	1678	443	381	6	298	848	35
2	1084	295	379	7	292	916	32
3	1092	311	351	8	483	920	53
4	1245	356	378	9	347	932	37
5	1271	397	320	1910	266	683	39
6	1155	382	302	1	296	704	42
7	1317	394	334	2	286	773	37
8	1083	397	273	3*	306	871	35
9	915	330	277	4	361	834	43
1880	918	340	270	5	427	1062	40
1	918	390	235	6	253	725	35
2	826	433	191	7	271	807	34
3	751	618	122	8	251	915	27
4	792	600	132	9	220	1021	22
5	958	643	149	1920	292	941	31
6	830	510	163	1	218	693	31
7	760	470	162	2	338	1489	23
8	610	443	138	3	133	677	20
9	696	542	128	4	262	1277	20
				5	155	851	18
				6	135	902	15

* The figures for years 1855–1913 inclusive are taken from the *Registrar-General's Annual Reports* and thereafter from the *Medical Officer's Annual Reports*.

pneumonia, although he does speak of pneumonia as affecting the lobes. What is now generally termed a central pneumonia, *i.e.* a deep-seated consolidation without physical signs is called a lobular pneumonia. In dealing with bronchitis he describes the capillary form, although he does not use this term, and he also recognises its severity and danger to life. In the fourth edition of the same work (1857) the terms are used similarly; a new term introduced is peripneumonia notha (hypostatic congestion). A very important statement occurs in Vol. II, p. 37, where he is lecturing on lobular collapse as being caused by plugging of the air tubes by portions of mucus. "This form of collapse occurs chiefly in the lungs of children, and it was formerly regarded as the consequence and evidence of lobular pneumonia. The condensation is not due, however, to present or to bygone inflammation, but simply to the

absence of air." This opinion, held by one of the leaders of medical thought of his day, would almost certainly be followed by a considerable number of the profession, if not by the majority. This view, we suggest, goes a long way towards explaining the rise in the proportion of deaths certified bronchitis from 1857. The same opinion is also held by Dr Aitken in his handbook of *The Science and Practice of Medicine* (1858). Speaking of obstruction of the tubes in bronchitis by mucus, etc., he states: "the result of such collapse is a condensation of the tissue of the lung; a condition which had previously been ascribed to a limited inflammation of the pulmonary tissue, known as lobular pneumonia, and which was commonly believed to be peculiar to infants."

If further confirmation is required we can find it in the *Manual of the Practice of Medicine* by George Hilario Barlow (1856). Speaking of bronchitis (p. 208) he states that "when the disease attacks infants and young children, it is frequently very little amenable to remedies, and is fatal in great numbers of instances more so than is perhaps commonly believed, since by far too many of such cases are set down as inflammation of the lungs, or pneumonia."

On p. 209 the same writer mentions capillary bronchitis in the following connection: "a severe attack of bronchitis affecting extensively the minuter tubes (the capillary bronchitis of some authors) is at all times to be dreaded." That he did not distinguish lobar pneumonia as it is now known is shown on p. 235, where regarding pneumonia he says: "it occurs also in the progress of disease depending upon a morbid poison, as measles, influenza and typhus fever." The terms lobar pneumonia and broncho-pneumonia were unknown to him although it is, for the most part, lobar pneumonia that he describes.

Turning to Glasgow writers, we find in Finlayson's *Manual of Medicine* (1875) that the term lobar pneumonia was then in use and that the disease was recognised as a definite specific type. On p. 58 dealing with the subject of crisis he states: "this method of termination is common in pneumonia (lobar), relapsing fever, typhus, etc." The brackets are in the original text. In an earlier Glasgow work, W. T. Gairdner's *Clinical Medicine* (1862), it can be inferred that lobar pneumonia was called idiopathic or simple acute inflammation of the lungs, for, relating his clinical experience of the session 1855-1856, Dr Gairdner states that he had "not seen a single fatal case of what is called idiopathic or simple acute inflammation of the lungs." He accounts on p. 25 for the Registrar-General's high figures for this disease by maintaining that most cases of pneumonia are terminal. Dr Gairdner confesses to finding difficulty in determining exactly what constitutes pneumonia. On p. 26 he maintains: "Again there are many cases of disease possessing something in common with pneumonia but in which the symptoms of that disease or even the physical signs are lost in those of a more complex disorder of the chest or of the system. It follows then that any attempt to estimate numerically our entire experience of pneumonia is subject to grave causes of fallacy."

The earliest use of the term broncho-pneumonia among the books con-

sulted was in *Outlines of Science and Practice of Medicine* by W. Aitken (1874). In this work (p. 471) inflammation of the air tubes (bronchitis) when found with pneumonia is described as constituting broncho-pneumonia.

It is noteworthy that so many authorities of this period remark upon the small number of cases of pure idiopathic inflammation of the lungs that they encounter. Sir Thomas Watson in all editions says that five or six cases among hospital patients are as many as he sees. "Intercurrent pneumonia however—pneumonia engrafted upon some other pre-existing disease—is abundantly frequent. Inflammation of the pulmonary substance is apt to supervene insidiously upon various disorders which are of every day occurrence; upon bronchitis; upon phthisis; upon disease of the heart; and upon fevers, especially the exanthematous fevers." Dr Barlow's experience also was that simple acute sthenic pneumonia, as he calls it, was "by no means a common disease."

We have shown what in our opinion has been the cause of the rise in the proportion of deaths, certified bronchitis, until in 1870 the maximum point is attained. From the maximum in 1870 of 412 bronchitis deaths per 100 pneumonia deaths there is a steady decline until in 1926, the low level of 15 bronchitis deaths per 100 pneumonia is found. What is the cause of this decline? In our opinion this has been due to the tendency to diagnose broncho-pneumonia from the general appearance of the child rather than from the physical signs, so that when the young patient is sharply ill, and no signs of consolidation but only evidence of catarrh of the smaller tubes can be detected, the case is regarded as broncho-pneumonia. This is due to the modern teaching on capillary bronchitis, that in the lower parts of the lungs, areas of atelectasis occur which are usually followed by infection with a resulting broncho-pneumonia. The position is well summarised by Osler and McCrae¹ in dealing with the distinction of bronchitis from broncho-pneumonia. "From acute simple bronchitis it is differentiated by the mildness of the symptoms in the former and by the absence of areas of hyper resonance and dullness in different parts of the chest. In bronchitis, moreover, the rales are coarser than in broncho-pneumonia. It would be futile to distinguish between capillary bronchitis, so called, and broncho-pneumonia for when the bronchioles are inflamed there is always more or less exudate and consolidation even though the physical signs pointing to that condition are obscure or wanting." In other words if the patient is very ill with bronchitis he must have broncho-pneumonia.

SUMMARY AND CONCLUSIONS.

1. Notification and hospitalisation have had no apparent effect on the death rate from pneumonia in Glasgow.
2. The notifications of pneumonia do not represent the true incidence of the disease, though there is reason to believe that in Glasgow they represent about 76 per cent. of the total cases.

¹ *System of Medicine*, 2nd ed. 2, 887.

3. It has been shown that in Glasgow the pneumonia mortality in children under five years is closely related to environmental conditions.

4. Evidence has been adduced to suggest that the mortality figures for pneumonia in children under five years are considerably influenced by outbreaks of measles and whooping cough, especially the former.

5. There has been in Glasgow since 1855 a striking alteration in the conception of what constitutes bronchitis and broncho-pneumonia in children under five years; what is now recognised as broncho-pneumonia once was largely certified as bronchitis.

The conclusion arrived at is that in statistical investigations upon bronchitis and pneumonia in children under five years for about the last 60 years certain sources of error which have been demonstrated must be very carefully considered in drawing any inference.

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