Dr. Ballard's interim report to the Local Government Board on an inquiry at Middlesbrough and its neighbourhood, as to an epidemic of so called "pneumonia", but which was infact a specific "pleuro-pneumonic fever" / [Edward Ballard].

Contributors

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Dr. Ballard's Interim Report to the Local Government Board on an Inquiry at Middlesbrough and its neighbourhood, as to an Epidemic of so called "Pneumonia," but which was in fact a specific "Pleuro-pneumonic Fever."

GEORGE BUCHANAN,
Medical Department,
March 15th, 1889.

Towards the end of May 1888, the Board received a communication from Dr. Malcomson, the medical officer of health for the borough of Middlesbrough, to the effect that a very fatal epidemic of pneumonia had for some weeks been prevailing there and that it was occasioning popular alarm; and he asked the Board's assistance in investigating its cause. I was instructed to visit Middlesbrough and undertake the inquiry. At a later period when it became apparent that the epidemic was not limited to the borough of Middlesbrough, but had been prevailing also in the adjoining Local Board districts of Ormesby, Normanby, and Eston, the Board instructed me to include these districts in the inquiry.

The inquiry was a novel and a difficult one; novel, because, although the Board had on various occasions noted in annual reports of the medical officers of health statements as to pneumonia having been epidemic in various parts of the country, these epidemics had never been reported to be so extensive as this one at Middlesbrough, and thus none of them had been made subject of investigation; and difficult, because there was nothing to guide me as to causation, except the analogy of the mode of causation of other epidemic maladies; that is, by one or another sort of infection. Nor did medical literature, so far as it was then available, help me materially. Concurrently with my etiological investigation, I had to study the disease clinically and pathologically. Having spent two months upon the spot, and having received the assistance of Dr. Klein for the microscopical and experimental part of the pathological investigation, I am yet obliged to limit my present account of the outbreak to those points which appear of most immediate importance, and to defer to a future report much of the evidence obtained as to the nature and causation of the disease. But in satisfaction of the very natural desire of the sanitary authorities of the districts concerned, it has been considered desirable that I should prepare this *interim* report, and that it should embody the principal results, pathological, clinical, and etiological, which up to this time have been arrived at.

The town of Middlesbrough stands on the south bank of the river Tees, about seven or eight miles from the mouth of its estuary, and the Local Board districts of Ormesby, Normanby, and Eston are situated between Middlesbrough and the sea on the same bank of the river. The greater part of the population of Ormesby is concentrated in the townlet of North Ormesby, of the population of Normanby in the little town of South bank, and of the population of Eston in the little town of Grangetown. Middlesbrough and each of these townlets has its own separate system of sewers, but the water supply of all of them is from the same system of mains. In the

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present decade Middlesbrough has grown with mushroom-like rapidity, and during the same period the other townlets mentioned have practically risen into existence. All this rapid growth has been the result of the rapid development of the iron and steel manufacturing industry in the Cleveland district. It is the principal industry of the whole district, and the vast majority of the houses in all parts are consequently of the class adapted to the requirements of a large labouring population and their families. This population is rough, partly nomadic, not addicted to sobriety, and often reckless in its habits of life.

On my arrival at Middlesbrough I found that the state of affairs had not been exaggerated. The fatality of the malady had been unusually high for "pneumonia" as medical men have of late years been in the habit of seeing it; and (according to the statements of medical practitioners in Middlesbrough) very much higher than the fatality of pneumonia observed in that town in former years. Some of the local medical practitioners held that it was a new form of disease, and popularly it had come to be designated "the new disease." There were various surmises put forth as to its cause, and even in the profession there were diversities of opinion. One explanation largely and indeed principally adopted by the labouring classes was that it was due to inhalation of fine dust proceeding from a new industry established at the North Eastern Steel Works, namely, the pulverisation and sifting of the basic slag resulting from the manufacture of steel by the Gilchrist-Thomas process; and some of the medical men in Middlesbrough were inclined to entertain this notion. Others, and with them a majority of the medical practitioners, attributed the prevalence of the "pneumonia" to the extraordinary character of the season, to a remarkable prevalence of easterly winds and to the fogs and concurrent dampness of the atmosphere which resulted from the emanations of marsh land lying along the bank of the river east of the town. Some of the medical men felt sure that it was communicated directly by infection from person to person; but the earlier instances adduced in support of this belief did not appear conclusive on the point.

The epidemic period may be regarded as having extended over 24 weeks or 6 lunar months, viz.: from the week beginning January 29th, to the week ended July 14th. I defer to my further and detailed report what has to be said about earlier and later occurrences of the malady.

It will be seen, too, that in the present report I give consideration mainly to the broader aspects of the epidemic as it affected Middlesbrough and the three adjoining local board districts above specified, dealing with all four places as if they constituted parts of a single district.

The following table shows the mortality from "pneumonia" among males and females, as well as irrespective of sex, for each four-weekly period during the epidemic, in the four urban sanitary districts severally and conjointly, together with the ages of the fatal cases distributed into four age-groups. Particulars as to meteorological conditions prevalent in each four-weekly period are added.

[Of deaths under 15 years of age, the large majority were infants under five years of age, and of deaths at ages 15 to 45 years very few were under the age of 25 years.]

4-Weekly Period ending	Deaths from Pneumonia.*					Deaths in Age-Groups (Years).				Mean Meteorological Conditions (Albert Park, Middlesbrough).				
	Borough of Middlesbrough.	Local Board District, Ormesby.	Local Board District, Normanby.	Local Board District, Eston.	Total.	0–	15–	45–	65 upwards.	Mean Temp. (Fahr.)	Mean Range of Temp. (degrees.)	Rain (ins.)	No. of Rainy Days.	Mean Direction of Wind.
	M. F.	M. F.	M. F.	M. F.	M. F.					°				
Feb. 25 -	18 6 = 24	1 3 = 4	2 1 = 3	3 1 = 4	24 11 = 35	8	12	12	3	38·4	9·3	1·09	6	N.W., N.E.
March 24 -	40 8 = 48	- 1 = 1	3 2 = 5	2 1 = 3	45 12 = 57	7	24	22	4	82·8	8·0	1·28	12	E., N.E.
April 21 -	34 8 = 42	—	3 - = 3	3 3 = 6	40 11 = 51	3	18	26	4	38·0	14·4	2·25	10	N.W., N.E., S.W.
May 19 -	43 8 = 51	1 2 = 3	4 2 = 6	3 2 = 5	51 14 = 65	5	28	24	8	43·2	16·1	1·66	9	S.W., W.
June 16 -	66 18 = 84	3 - = 3	9 2 =11	6 2 = 8	84 22 = 106	9	44	39	14	50·4	19·9	1·48	9	Var.
July 14 -	31 5 = 36	3 1 = 4	8 1 = 9	2 4 = 6	44 11 = 55	3	29	13	10	51·8	22·0	1·44	13	N.E., Var., S.W.
	232 53=285	8 7=15	29 8=37	19 13=32	288 81=369	35	155	136	43	—	—	—	—	—

* Deaths which occurred in hospitals and among persons admitted for treatment into the Workhouse Infirmary have been entered in the districts from which the individual cases came.

The population of Middlesbrough in 1888, according to a careful estimate made by the medical officer of health, was about 69,255 persons; and the population of the other three sanitary districts (calculating 5½ persons to a house in each) was,—Ormesby, 8,662; Normanby, 9,069; and Eston, 10,620. Taking these figures as approximately correct, the incidence of the fatal epidemic pneumonia on these districts was in deaths per 10,000 of population—

Middlesbrough	41·4
Ormesby	17·3
Normanby	41·2
Eston	30·1

The actual number of fatal cases occurring in each sex, and in each district is seen in the table on page 2.

As regards the incidence of the recent "pneumonia epidemic" mortality upon persons of different sexes, it has to be recorded for the aggregate of the districts in question, that no less than 78 per cent. of the deaths were in males, and only 22 in females. In Middlesbrough itself, the males bore 81 per cent. of the pneumonia mortality, the females only 19. This is an excess upon males far more marked than in the customary fatal pneumonia of the kingdom generally. In 1881, for example, the relative incidence of deaths recorded under this name was 58 upon males, and 42 upon females for England and Wales; and the relative incidence observed in Middlesbrough (in 28 weeks covering the epidemic season of 1888) during eight years preceding 1888 had been 66 and 34 upon males and females respectively.

Assuming the proportion of males and females of all ages in Middlesbrough to be the same as in 1881 there were in the borough in 1888, 36,177 males and 33,078 females. The incidence then upon each sex was, on each 10,000 males 64, and on each 10,000 females 16. Whichever way considered, *the exceptional incidence of the mortality on the male sex* then was a remarkable feature of the epidemic.*

Equally remarkable was its *incidence upon age*. Distributing the population of the *borough alone* into age groups (and assuming the numbers in each group to bear to each other the same proportion as in 1881) we get the following results:—

MIDDLESBROUGH, 24 EPIDEMIC WEEKS of 1888.

Estimated Population in Age Groups, 1888.				Deaths from "Pneumonia" in Age Groups.				Rate for 24 weeks per 10,000 Living in Age Groups.			
Years.				Years.				Years.			
0—	15—	45—	65 up.	0—	15—	45—	65 up.	0—	15—	45—	65 up.
27,893	32,306	7,699	1,357	20	117	115	33	7·2	36·2	149·4	243·2

For comparison I give the following figures:—

MIDDLESBROUGH, Corresponding 24 WEEKS during EIGHT YEARS, 1880–87.

Census Population, 1881 in Age Groups.				Deaths from "Pneumonia" during Eight Years in Age Groups.				Annual mean Rate per 10,000 Living in Age Groups.			
Years.				Years.				Years.			
0—	15—	45—	65 up.	0—	15—	45—	65 up.	0—	15—	45—	65 up.
22,528	26,092	6,214	1,100	141	164	134	41	7·8	7·9	26·9	46·4
				Annual Mean.†							
				17·6	20·5	16·7	5·1				

* There are reasons however for suspecting that this *exceptional* mortality among males may have been due partly or wholly to other causes than a peculiarity in the character of the epidemic.

† When comparing these means of eight years' deaths with those of 1888, allowance must of course be made for the growth of the population from 55,934 in 1881 to 69,255 in 1888.

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ENGLAND AND WALES, whole of 1881.

Census Population in Age Groups.				Deaths from "Pneumonia" in Age Groups.				Annual Rate per 10,000 Living in Age Groups.			
Years.				Years.				Years.			
0—	15—	45—	65 up.	—0	15—	45—	65 up.	0—	15—	45—	65 up.
9,468,591	11,609,672	3,707,532	1,188,644	11,966	4,781	4,287	2,688	12·6	4·1	11·6	23·3

From these tables the following inferences may be drawn, viz. :—

1. That in the age group under 15 years of age the rate of mortality from "pneumonia" during the 24 epidemic weeks was about the average of that from "pneumonia" in the corresponding weeks of eight previous years.

2. That at ages above 15 years it was very much higher—about five times that of the mean annual "pneumonia" mortality in the corresponding weeks of eight previous years.

3. That while during the part of previous years just referred to, the rate of mortality from "pneumonia" was observed to increase with age, and while the same thing was observed during the epidemic season of 1888, there is this difference to be noted—viz., that in the age group 15 to 45 years, the rate of the mortality was 4·6 times that of the mean of eight years, and at ages above 45 it was 5·4 times that of the mean.

It is not to be gathered from the first of the above inferences that the "pneumonia" from which the 20 children died during the epidemic season of 1888 was a different sort of pneumonia from that which at the same time was killing grown-up people to such an unusual extent. For again there was noticeable an exceptional incidence on the male sex. Of the 20 deaths, 15 were of males and only 5 of females; whereas, during the 24 corresponding weeks of the previous eight years, the numbers of males and females dying of "pneumonia" under 15 years of age were nearly equal.

It is difficult to ascertain the *prevalence* of the "pneumonia" as a malady regarded apart from the mortality it occasioned. Few of the medical men kept complete lists of their cases, and, although nearly all of them gave me lists of some kind, there were only 12 whose lists could be trusted as containing all the cases they had attended during the epidemic period.

These 12 lists contained a record of the names, ages, and result of 762 cases. Of these cases 225 were under 15 years of age; so it is obvious that although few children died from "pneumonia" they were not by any means exempt from attack.

These 762 cases permit me to estimate the *fatality* of the disease. Age had clearly very much to do with the result of the cases.

Of 225 cases under 15 years of age 17 died, or 7·6 per cent. of attacks.
„ 537 „ 15 years old and upwards 159 „ 29·6 „ „
„ 762 „ at all ages 176 „ 23·1* „ „

Speaking of "pneumonia" within the common experience of the profession, and not only of the disease as seen in hospitals, this must I think be regarded as an unusual fatality.

If these fatality rates be truly representative, it may be calculated that in the whole district of Middlesbrough and the adjoining local board districts which this report deals with, there would have occurred altogether about 1,600 *cases of the so called "pneumonia"* in persons of all ages, about 470 cases in persons under 15 years of age, and about 1,130 cases in persons over 15 years of age; that is to say, if the ages of the population of the whole included districts are distributed as they are in Middlesbrough (which is probably the case), the disease attacked about 168 per 10,000 of those under 15 years of age, and about 273 per 10,000 of those aged 15 years and upwards.

* The fatality rates given in the text can scarcely be regarded as being exaggerated, since of 67 cases of pneumonia admitted for treatment into the Workhouse Infirmary between November 1887 and the end of 1888 (and mostly during the epidemic period) from various parts of the district included in the inquiry, and aged 15 years and upwards (only three having been more than 65 years of age), 31 died or 46·3 per cent.: and of 20 *inmates* of the Workhouse aged 15 years and upwards, who were attacked with pneumonia, 15 died or 75 per cent. But of these 20 inmates, seven were 65 years old and upwards, and all of these 7 died; of the remaining 13 persons eight died or 61·5 per cent.

The *clinical* features of the disease observed in adults were in general terms as follows :—

Most frequently the attack was sudden, the patient being, so far as he knew, in his usual health at the time of seizure. In other cases he may have felt a little out of health for a day or two previously, or even longer. Rigors, now and then passing into an actual convulsion, were the invariable commencement. Pain in the side quickly followed, and the bodily temperature very rapidly rose so as sometimes to reach 104° in a few hours, with rapid pulse and quick respiration. Vomiting or diarrhœa, or both together, but mostly vomiting, usually occurred as an early symptom, sometimes, however, not until the second or third day, or both might be absent throughout the case. Delirium, sometimes active and violent, occurred often early in the attack, and in one remarkable case it accompanied the initial rigor in a sudden seizure. It was very rarely absent after the second or third day. The amount of cough was usually trifling, and the expectoration, at first tenacious and rusty, became after a few days of the "prune juice" character. Hæmorrhages—most frequently epistaxis—were occasionally observed, and in more than one case I have on record there was severe hæmatemesis shortly before death. With all this there was usually prostration, sometimes great prostration, even in cases destined to recover. The physical signs of pleuro-pneumonia were usually quickly, but sometimes tardily, developed, dullness on percussion with tubular breathing and friction sounds being observable. The pleuro-pneumonia was either single or double; or it was first observable on one side, and then relapse occurred, and the pleuro-pneumonia affected the other side or both sides; but relapses occurred also in cases of double "pneumonia." In a good many fatal cases death occurred on the third to the fifth day of illness, not many of them were of much more than a week's duration. In cases destined to recover a crisis was observed on the seventh to the tenth day, when the temperature rapidly fell to about normal, and convalescence set in. Various sequelæ were observed in a proportion of the cases, some of them being apparently due to the occurrence of embolisms; sometimes these were fatal.

The *post-mortem appearances* were of a fairly uniform character. The lungs gave evidence of lobar pneumonia, rarely however advanced to the stage of grey hepatisation. The pleura invariably had lymph effused upon both the costal and pulmonary surfaces, and contained more or less turbid liquid effusion in addition. The heart contained a coagulum, always on the right side, but usually on both sides, in which the fibrin had more or less separated. In the left side especially the fibrinous character of the clot when it occurred was remarkable, and the mass of fibrin was separable with difficulty from the trabeculæ among which it was entangled: on both sides the fibrinous coagula now and then extended from the heart into the large vessels arising from it. This separation of fibrin was apparently an ante-mortem condition. In one case there was a patch of recently effused lymph found upon the pericardium, and in another case there was endocarditis with a soft fibrinous vegetation on one of the aortic valves, and a small ulcer in the pouch behind it. The spleen was almost invariably nearly pulpy; at any rate it was so soft that a clean section of the organ could not be made. There were morbid conditions observed also in the liver and kidneys. In all cases there were more or less of ecchymoses in the mucous membrane of the stomach, and in one case a quantity of what looked like partially digested blood. Dr. Klein found in the fresh lung juice a hitherto undescribed bacillus, that he regards as specific, and which will be fully described in my detailed report. The same bacillus was found in fresh sputum.

This fatal epidemic malady was evidently not an ordinary "croupous pneumonia" but a *specific febrile disease* of which a form of pleuro-pneumonia is the most striking and conspicuous local feature. It was in short a "specific fever" to which the name "pleuro-pneumonic fever" may be properly attached. The disease ranks as such with "typhus," "enteric," and "relapsing" fever. It is on this ground worthy of all the study that can be bestowed upon it. I am disposed from some facts in my possession to think (but I speak here with hesitation) that it was not absolutely a *new* disease even to Middlesbrough; but that here and elsewhere in the Kingdom it has occurred from

time to time in the form of epidemics, although probably of smaller proportions: still its distinctly specific character has not hitherto been recognised.

In this brief summary of the results of a prolonged investigation, I do not propose to enter fully into the *etiology* of the disease. The following statements may suffice for present practical use :—

1. The *specific febrile disease* thus described must be regarded as having been *infectious*, in the sense of being communicable from the sick to the healthy. Of this I shall be able to adduce the most conclusive evidence. This communication would seem to have occurred—

(*a.*) Through direct relation of individuals with each other; and it probably occurred also

(*b.*) Through the medium of emanations from sewers, drains, &c., which had received into them the sputa or other excreta of the sick, or had become infected in other ways.

(*c.*) Through the medium of food which had become infected. [There is no evidence that it was in Middlesbrough communicated through the medium of drinking water.]

2. Exposure to "slag dust" was obviously not the primary cause of the malady. But among assisting causes of attack by the specific disease may be mentioned exposure to the inhalation of this *and other* kinds of trade-dust, and also exposure to chills or unusual bodily fatigue.

3. As is commonly observed with respect to other diseases of the same class as this, various local unwholesome conditions of lodgment and of the immediate surroundings of the population assisted in the spread, and probably also in the intensification of the malady.

These are points which will be fully discussed in my detailed report. What I have written above will be sufficient, for the present, to guide the several Medical Officers of Health in the districts concerned in respect to the advice they should give to their several sanitary authorities for the prevention of a repetition of last year's unfortunate occurrences; and to induce them to adopt, for their immediate purposes, precautions against the growth and spread of the infectious matter of the disease, *just as they would adopt precautions against any other infectious disease* which they regarded as *capable of being conveyed through the air* or *by infection of sewers or of food.*

I may add that, before quitting Middlesbrough, I gave some general advice verbally to a Committee of the Town Council as to requisite local improvements and amendments in their sanitary administration, and left with the Town Clerk a memorandum of this advice.

January, 1889. EDWARD BALLARD.