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" A CRITICAL STUDY OF PULMONARY TUBERCULOSIS "

"IN AN "

" ENGLISH COUNTY BOROUGH "

(Being an investigation of the cases notified to the  
Local Authority during the years 1912-1930)

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# C O N T E N T S

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INTRODUCTION:	Page 1
I	EPIDEMIOLOGY
	A. - Annual Decline 2
	B.- Age and Sex Incidence 3
	C. - Social Factors 5
II	ETIOLOGY
	A. - Heredity and Familial Influence 8
	B.- Influence of Domestic Contact 10
	C. - Influence of Other Factors 13
	(a) Occupation 13
	(b) Trauma 13
	(c) Types of Chest 14
	(d) Previous Lung Disease 14
	(e) Asthma 14
	(f) Other Diseases 14
	(g) Habits 15
	(h) Insanity 15
	(i) War Service 15
	(j) Childbearing 16
	(k) Non-pulmonary tuberculosis 17
	(l) Conditions antagonistic to phthisis 17
	(m) Tuberculin Tests and their Etiological Significance 18
III	SYMPTOMS 19
IV	PHYSICAL SIGNS 21
V	SPUTUM EXAMINATION 24
VI	COMPLICATIONS 27
VII	HEALTH OF CONTACTS 29
VIII	PROGNOSIS 30
IX	ERRORS OF DIAGNOSIS 35
X	PULMONARY TUBERCULOSIS IN CHILDREN 39
XI	TREATMENT 42
XII	CONCLUSION 43

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A CRITICAL STUDY OF PULMONARY TUBERCULOSIS IN  
AN ENGLISH COUNTY BOROUGH

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Introduction:

No subject bristles with more problems than the disease known as pulmonary tuberculosis, and indeed, each aspect of the disease repeats this feature, the more specialised the enquiry made. My intention, however, is to survey broadly the whole field in an attempt to throw light on the main factors which make its prevention difficult.

I was somewhat fortunately placed as Assistant Tuberculosis Officer in a small English County Borough, Burton-on-Trent, where there was a compact urban community with little migrational change from year to year. Research was made into all the data available regarding notified pulmonary tuberculosis from the beginning of notification in 1912 to the end of the year 1930. Personal knowledge and examination of many of the cases still surviving led me to think that the study of the problem in this Borough might be valuable. The compulsory overhaul of tuberculosis statistics, rendered necessary by the memorandum 37T of the Ministry of Health (1925) fell largely to me, and thus made much of the work common ground with this project.

That I am on ground which has been thoroughly ploughed before me, I am well aware. I take courage, however, from the present trend of medical research to rely on observation rather than on experiment, the "Neo-Hippocratism"<sup>(1)</sup> which is a school of thought somewhat different from a narrow specialism.

A word about the scene of the work might be of interest. Burton-on-Trent is situated in a valley at the border of Staffordshire and Derbyshire. The main occupations of the inhabitants are brewing and its allied trades. The population is practically stationary at 50,000 and there are no marked evil influences on the health of the people. Indeed the community is well housed with an average of four persons per house, and the prevalent type of house is one of four living rooms and a scullery. Only 18% of the houses in the borough fail to reach this standard. Sanitation, apart from housing, is good throughout the town.

(1)  
Hutchison R - Harveian Oration (Royal College of Physicians) 1910:31.

A. - Annual Decline.

In recent years, a factor, common to tuberculosis statistics in most countries, has been an annual decline of its mortality and incidence, and this feature is equally marked in both pulmonary and non-pulmonary forms, and is much greater proportionately than the fall in the general death-rate.

Tuberculosis Statistics - Burton-on-Trent - 1896-1930  
(Quinquennial Averages)

Year	Average Population	Average Pul. T.B. Notified	Average Pul. T.B. Deaths	Annual Death-rate per 1000	Average Non.Pul. Deaths
1896-1900	51513	-	79	1.5	13
1901-1905	49933	-	65	1.3	21
1906-1910	48847	-	66	1.3	21
1911-1915	47499	113	61	1.3	16
1916-1920	45216	97	57	1.2	17
1921-1925	49580	73	47	.9	11
1926-1930	48898	49	35	.7	7

It is evident that improvement took place mostly in the years following compulsory notification and the commencement of sanatorium treatment. Simultaneously we have an improvement in the non-pulmonary form of the disease, and this two-fold change suggests the conclusion that sanatorium isolation of phthisis cut out much of the infection previously broadcast among the people.

I must admit, however, that improved sanitation (especially as regards industry and housing), improved wages, and the elimination of susceptible individuals and families have also combined to make the race more resistant to tuberculosis. Sir Robert Philip has shown that the decline has been accelerated from each decade to the next, and it is quite a legitimate conclusion that as humanity has gradually been educated to regard phthisis as infectious, so has the spread of infection been limited.

(2)

Philip - Public Health - August, 1928 - p.326.

B. - Age and Sex Incidence.

Of late years phthisis has affected males much more than females, although it was not always thus, as a glance at national statistics prior to 1900 shows. Today female incidence is roughly five sixths of the male incidence in the country as a whole, but in urban communities the preponderance of the disease in the male becomes striking. (3) Burton-on-Trent is no exception to the rule. Taking both the crude statistics of notification, and those corrected for errors in diagnosis and doubtful cases, a marked preponderance of infection in the male is beyond question.

Annual Incidence of Notified Pulmonary Tuberculosis in  
Burton-on-Trent (with analysis of the cases).

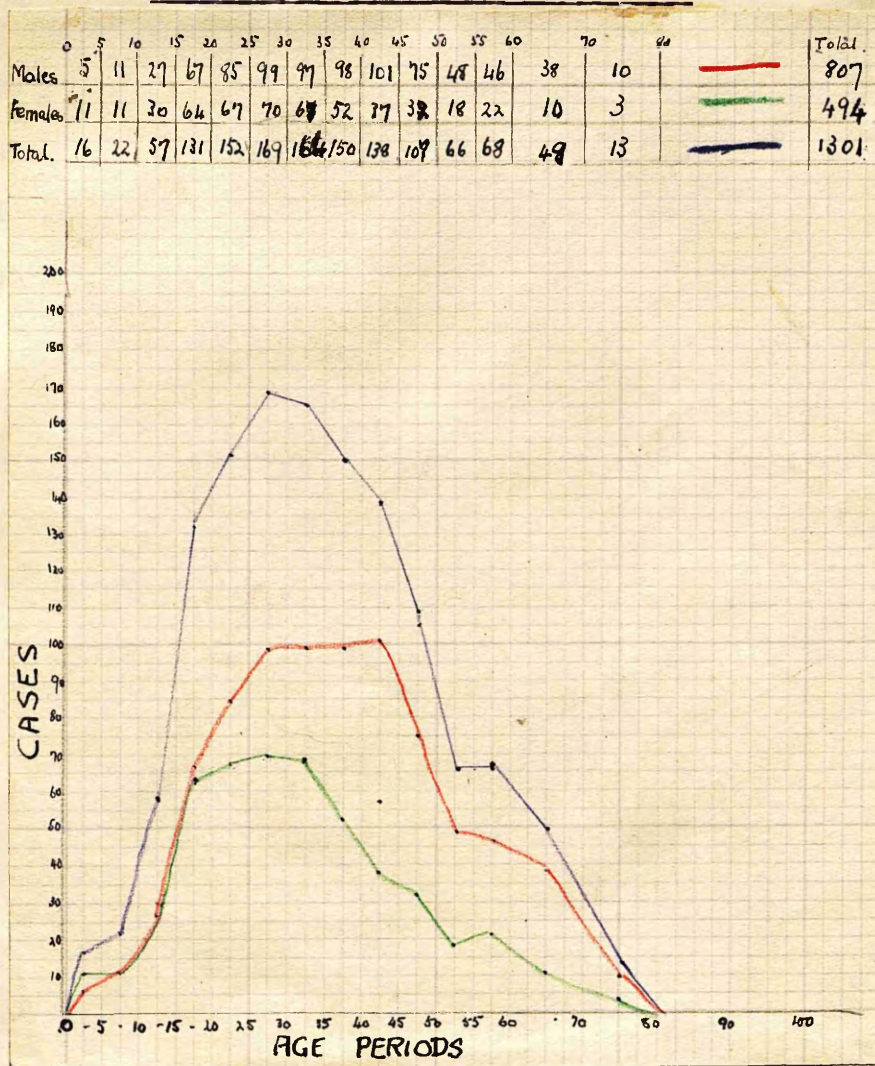
Year	Tuberculosis genuine		Tuberculosis doubtful		Not Tuberculous.		Total		Total cases Notified.
	M.	F.	M.	F.	M.	F.	M.	F.	
1912	80	54	5	4	4	4	89	62	151
1913	50	26	8	3	4	1	62	30	92
1914	59	27	2	5	11	5	72	37	109
1915	64	27	6	2	-	1	70	30	100
1916	68	28	4	2	3	2	75	32	107
1917	46	28	3	2	2	2	51	32	83
1918	49	27	6	8	3	2	58	37	95
1919	40	29	16	5	9	5	65	39	104
1920	58	21	5	6	6	-	69	27	96
1921	33	35	7	6	7	2	47	43	90
1922	31	32	2	6	1	5	34	43	77
1923	32	19	2	1	3	-	37	20	57
1924	26	22	-	4	3	4	29	30	59
1925	45	28	3	2	4	3	52	33	85
1926	31	21	2	2	-	3	33	26	59
1927	36	27	1	2	4	2	41	31	72
1928	24	20	-	2	4	1	28	23	51
1929	22	12	-	1	1	1	23	14	37
1930	23	11	1	1	1	3	25	15	40
Totals.	817	494	73	64	70	46	960	604	1564

(3) Statistics of the National Association for the Prevention of Tuberculosis - 1924



Analysis of age and sex incidence of notified pulmonary tuberculosis (after correction for errors of diagnosis) shews the distinct disparity between the sexes only over twenty years of age. The relevant figures given here, although those of crude incidence of genuine notified phthisis, give curves strictly comparable with curves of urban age incidence in England and Wales <sup>(4)</sup> based on deaths per million.

Table and Curves of Age and Sex Incidence of Phthisis in  
Burton-on-Trent, 1912 - 1930.



The explanation of this must be obviously the different vocations of the sexes after marriageable age, Marriage for the woman spells mainly home life and mixing with others outside the family only in the open air. The man continues throughout life in vocations which mean intimate contact with others at work in offices and factories. To put things in another way, what seems/

(4)  
Tuberculosis Statistics - 1924.

seems/

to determine this varying incidence in the sexes is the amount of exposure to infection from cases of open phthisis. In rural communities, the sex incidence does not shew this anomaly.

(5)  
Brownlee in his statistical study of phthisis has described three types varying with age of onset. I cannot confirm his findings as to the age types of phthisis.

#### C. - Social Factors.

A considerable number of features, when analysed in relation to the spread of pulmonary tuberculosis, reveal<sup>s</sup> results for the most part harmful. Each feature is difficult to assess alone, but there is no doubt as to the cumulative effect of all. In brief, there is ample evidence to prove that the higher the social status, the less risk there is of affliction with pulmonary tuberculosis. This statement is dependent on the fact that low social status infers poor housing with its accompanying evil of overcrowding, coupled with a low family income, or with an income often badly utilised. Various other influences operate here, in that there are often evil habits such as habitual drinking in low public houses, a fact which still more depreciates the family income and the standard of housing and hygiene. Ignorance and carelessness are also most evident in the lowest classes, and any public health official would readily bear witness to the difficulty of getting such people to protect themselves against extremely virulent infections.

To demonstrate the foregoing, no one would cavil at the adoption in a survey of an index shewing housing conditions. By marking out the phthisis cases notified in each street of the town, and comparing these with the number of houses in the street, a basis of comparison was reached. In the whole town of Burton-on-Trent, with 12,000 occupied houses, 1311 genuine phthisis cases were notified. The index thus obtained is roughly one phthisis case per nine dwelling houses.

Assessing each street on the same plan, there were obtained ratios varying from one case per 1.5 dwelling houses to one case per 39 dwelling houses. These streets were at the extreme ends /



ends/

of the scale of housing. The poorer index applied to the universally despised slum street of the borough, the other to the universally respected boulevard. Between these two extremes, each street seemed to fit exactly as one would expect from the prevalent standards of housing.

The English habit of building similar houses in rows helps one still further to show the truth of the main contention. Streets characterised by houses of three apartments and a scullery yielded one phthisis case per six houses, those of four apartment houses one case per nine houses, those of five apartment houses one case per eleven houses, and those of mainly six apartment houses or more one case per sixteen houses. Streets where the houses were mixed in type yielded a ratio of one case per ten houses, a figure comparable with the average for the town.

A 'spot map' of the cases showed the position even more intensely. The parts of the town where phthisis was rife were those parts where the houses were close together and of the smallest type, in fact, those areas chiefly inhabited by the unskilled labouring classes. Residential areas showed a very sparse distribution of cases.

No harm can be done by stressing the importance of these social factors. All public health officials cry out about them. Thus we read that in Birmingham "The incidence is twice as high in the crowded poor class central wards as it is in the more suburban areas"<sup>(6)</sup>. As long ago as 1908, Mair reported on the malignant influence of defective housing on the incidence of the disease, and this aspect of the tuberculosis problem has been emphasised ever since in textbooks of preventive medicine.

In conclusion, it is patent that in slums easy channels of spread of disease exist from the case of open phthisis to neighbours, and especially to others in the same house. The slum-dwellers again, are exactly those most unfitted to fight infection, and so the vicious circle continues.

(6)

Annual Report of Tuberculosis Officer - City of Birmingham, 1929.

I can find no evidence of spread of phthisis by reason of healthy families occupying premises recently vacated by the tuberculous. Such instances are in my opinion so rare as to be of the nature of coincidence.

N.B. Where the totals of cases studied statistically in this paper fall short of 1311, it will be understood that information was not available to the extent by which the totals fall short of this number.

The greatest confusion exists in discussion of tuberculosis, due to the existence of tuberculous infection, which is to be considered as a quite distinct entity, although related to tuberculous disease. This point is hardly ever kept in mind, even by the most distinguished specialists. (1) Post mortem evidence and the data afforded by the (2) many observers who have practised the Von Pirquet and Mantoux tests on unselected human subjects, demonstrate conclusively the universality of infection by Koch's bacillus. The latter results, however, show that the age incidence of tuberculous infection is entirely different from the age incidence of the disease, either in the lungs or elsewhere. Very few of those certainly infected with the bacillus ever show clinical evidence of such infection. In this survey, one is, of course, dealing with clinical disease.

A. - Heredity and Familial Influence.

The possibility of hereditary transmission of tuberculosis is a problem of academic interest only. All infants are born free from tuberculous infection. A high incidence in certain families is a marked feature of pulmonary tuberculosis in common with other infectious diseases. This is not so marked in non-pulmonary disease. Accordingly, an inherited increased susceptibility to phthisis has been postulated, while the obvious cause of familial incidence is relatively ignored. It is surely the opportunity for direct spread that favours a high incidence in certain families. Massive dosage of the infecting organism is so obviously possible in a family living in a small house, that I am convinced that here is the clue to the familial tendencies of tuberculous lung disease.

1043 cases of pulmonary tuberculosis when analysed in this relation yielded the important finding that 301 belonged to 119 families, in which other cases of pulmonary tuberculosis had occurred.

(7)

M. Fishberg - Pulmonary tuberculosis 1922 - Chapter on Epidemiology.

(8)

Wingfield R.C. - British Medical Journal 31:10:31 p.787

Familial Incidence of Pulmonary Tuberculosis  
(excluding conjugal tuberculosis.)

No. of families with -

<u>2 cases</u>	<u>3 cases</u>	<u>4 cases</u>	<u>5 cases</u>	<u>6 cases</u>	<u>7 cases</u>
88	15	8	3	2	3

119 families with 301 persons affected.

Examples of these histories are given herewith:-

S. Family(all cases of open phthisis and deceased)

First case F.S. male aged 19 - discharged from army with phthisis 1916 - no previous tubercular disease in this family. Died in 8 months. Sister aged 20(K.S)had haemoptysis at the latter end of 1916 and died in 6 months. Sister (N.S.) aged 12 and another (N.S.) aged 20, and the father aged 50, were next notified simultaneously in 1918, the two sisters with haemoptysis and the father with pleurisy. These died in  $4\frac{1}{2}$ ,  $2\frac{1}{2}$ , and  $1\frac{1}{2}$  years respectively, after notification. In 1920, another sister (M.S.) aged 17, manifested the disease, and died in 1922, in which year another sister (Mary S.) began to spit blood, to die in 1924. (Only one child of this family survived; in 1930 she was 15 years of age and as yet unaffected.)

R. Family

A.R. discharged from army 1916 with open phthisis - died in 5 years. Mother (a diabetic) showed signs of the disease in 1921 and died 8 months later. The same year G.R., brother of A.R. yielded a positive sputum and died in 1924. Three years later V.R. another brother, developed glandular and pulmonary tuberculosis to die in 1930. In this family, all of four sisters have enjoyed good health and are still alive.

Conjugal Tuberculosis

In the 1043 cases analysed, (of whom 623 were married or widowed) there occur 24 instances of conjugal infection, both husband and wife suffering from the disease consecutively or simultaneously. This gives a 4% incidence of conjugal tuberculosis in married couples, where one of the partners was affected with phthisis, a figure (9) strictly parallel to that recorded by Mongour. I consider this percentage to be on the whole too high to merit the conclusion that marriage to a tuberculous spouse is not a serious danger. Davidson (10) considers the danger to be equivalent to that of ordinary domestic contacts, but I consider the danger greater on account of the age of the parties.

(9)

Mongour - Cong. Internationale de la Tuberculose - Paris 1905

(10)

Davidson - British Journal of Tuberculosis Vol. XXVI, April 1932.

The following case is of interest in this connection:-

Sp. Family

Mrs. Sp. aged 38 years, yielded a positive sputum in 1918, to die 3 months later. In 1919, a baby H.L. of one year (not of this family but living in the same house) died of tubercular meningitis. The son of Mrs. Sp. aged 12 years, developed pulmonary tuberculosis in 1919 and died in 1922. A daughter aged 11 years died in 1922 of open phthisis. A Sp. husband of Mrs. Sp., in 1925 developed open phthisis, to die in two years, while his second wife developed phthisis in the same year while pregnant, and died 6 weeks after the birth of her baby.

I know of no more striking instance of the effects of massive dosage of tubercle bacilli than these cases.

B. - Influence of Domestic Contact

The effects of this alleged familial influence extend to all persons resident under the same roof as the case of open phthisis. Thus lodgers were frequently infected from such a source, while the opposite occurred, the family curse beginning with the admission to the home of a tuberculous lodger. Examples:-

(1) W.T. invalided out of the army (1915) with open phthisis, went to lodge with Mrs. F., who died at the end of 1916 from open phthisis.

(2) C.M. invalided from army with open phthisis met W.F. in 1922 in sanatorium - W.F. a suspect only. On discharge from sanatorium C.M. was taken in by W.F. as a lodger. He lived 9 years, and W.F. finally developed open phthisis, as did his daughter, who succumbed in 1928.

(3) A.B. developed open phthisis in 1922. At this time W.R. lodged with the B's. In 1924 W.R. developed open phthisis.

Other Intimate Contact

While dealing with the subject of intimate contact as the mode of transference of pulmonary tuberculosis, it would be well to admit here other instances of this factor. Fifteen cases of pulmonary tuberculosis gave a history of close contact with open phthisis while at work, and this statement was verified.

(1) M.H. aged 15, was one of 3 assistants in a shop, when she developed open phthisis and died in 1924. In January 1926, L.F. aged 19, a second assistant, previously healthy, developed a slight cough with a positive sputum. In the family of L.F. there was no history of tuberculosis.

(2) C.B. aged 53, developed open phthisis, which was diagnosed in 1927 by himself. He had, through fear, refrained from consulting a doctor, knowing the nature of his complaint, but had continued working for many months as a compositor. In the same printing office, worked H.D., aged 30, who had a slight haemoptysis two months after C.B. gave up, and subsequently yielded a positive sputum.

Other rare instances of contact were to be found in neighbours with a common back-yard, and in friends nursing patients with phthisis.

(1) In 1925, G.S. died of open phthisis. His two married daughters Mrs. M. and Mrs. E. developed phthisis in 1928, although living at different addresses. The former was notified simultaneously with her neighbour Mrs. W. in 1928. Mrs. M. had a cough and sputum for 2 years prior to notification, and Mrs. W. only for 6 months before notification. All had positive sputa. Mrs. M. and Mrs. W. were in adjoining houses with a common back-yard. There was no history of tuberculosis in Mrs. W's family.

(2) W.P., aged 29, developed open phthisis in 1913, and died in 1914. In 1921, his neighbour's wife, Mrs. H. developed open phthisis, the sole source of infection traceable being that she nursed W.P. in his illness.

( // )

It is often taught that intimate contact means the setting up of immunity in the individual exposed. Where the resistance is poor, this is not so. The infrequency of infection among sanatorium nurses is often pointed to as a demonstration of the harmlessness of contact, but the statistics do not in my opinion warrant any conclusion. In 13 cases of alleged closed phthisis treated in sanatoria, the sputa became positive and rapid death ensued at the end of a period longer than 3 years. In my opinion, the patients may have been infected in sanatoria.

#### Development of Pulmonary Tuberculosis in Contacts

On investigation of the interval between the diagnosis of the first and subsequent cases of phthisis in the conjugal group of cases, it was found that the second partner became manifestly affected within 10 years of the original diagnosis in 23 instances, the remaining case developing 13 years after exposure to infection. Among the familial infections, 175 out of a total of 182 whose exact histories were obtainable, also developed the disease within 10 years. The greater half of all these developed the disease within 5 years of known exposure to infection.

Throughout the preceding paragraphs I have stressed the importance of the 'contact' element in the spread of pulmonary tuberculosis. The following table sums up these findings in Burton-on-Trent.

( // )

Fishberg - Pulmonary Tuberculosis 1922 - p.148.



Analysis of Notified Phthisis in Regard to Contact Infection.

Cases with previous intimate contact within preceding five years -

(a) With husband or wife.....	14	
(b) With other relations or lodgers.....	248	
	<u>262</u>	- 262

Cases with previous intimate contact over five years before notification -

(a) With husband or wife.....	10	
(b) With other relations or lodgers.....	175	
	<u>185</u>	- 185

Cases with close contact at work ..... 15 - 15

No history of contact in ..... 581

462

581

1043

Nearly half of the notified cases of phthisis yielded a positive history of exposure to infection. That this proportion is an under statement I have little doubt. When investigating newly notified cases, I met with several instances of deliberate denial of familial tuberculosis, although this was easily ascertained from the notification records. This tendency among the phthisical and their relatives to conceal an evil blot on the family life, is responsible for many cases giving a negative family history. In recent articles Wingfield<sup>(12)</sup> and Dow and Lloyd<sup>(13)</sup> both stress the excessive amount of tuberculous infection and general ill health in contact children. Yet these children do not suffer from pulmonary tuberculosis, because they are at an age which is relatively insusceptible to this lesion. In adults and adolescents the position is worse, contact leading to definite disease in many cases.

A Comparison with Smallpox

Such a high proportion of cases with a history of contact with other infectious patients is exactly parallel to that found on investigating outbreaks of more acute infection (not spread by carriers). In 1925, I investigated an outbreak of 181 cases of smallpox in Kettering, Northants. 86 cases were derived from 26 families, (2 families of 9 individuals, one of 8, 2 of 5, one of 4, 6 of 3, and 14 of 2.) Intimate personal contact at home or at work was traceable in 129 cases out of 181, but the remaining 52 could not identify either the source or mode of infection.

(12) Wingfield R.C. B.M.J. 31st Dec.1931. p.787

(13) Dow & Lloyd - B.M.J., Aug. 1st.1931. p.183

# C. - Influence of Other Factors.

## (a) Occupation

The table given below summarises the occupational findings:-

### Occupations of Cases of Pulmonary Tuberculosis - Burton-on-Trent, 1912-1930

<u>Males</u>		<u>Females</u>	
1. Brewery workers - (labourers, maltsters,coopers)..200		1. Housewives .....	268
2. General labourers, engineers etc.....123		2. Factory workers .....	47
3. Shop assistants ..... 55		3. Domestic ..... 41	
4. Professional men -		4. Shop assistants .....	35
Teachers, agents, etc ..... 46		5. School girls .....	27
5. Clerks ..... 38		6. Typists and clerkesses ....	12
6. Building tradesmen ..... 38		7. Girls under school age ....	10
7. Railwaymen ..... 31		8. Nurses .....	7
8. Schoolboys ..... 26		9. School teachers .....	1
9. Miners ..... 13		10. No occupation .....	20
10. Agricultural labourers ..... 13			
11. Boys under school age ..... 6			
12. Miscellaneous and no occupation .194			
	<u>783</u>		<u>468</u>

No conclusions could be drawn that occupations had any effect on the incidence. Miners and labourers,whose work was mainly out-door, were to my mind relatively, but not absolutely, immune. Among shop assistants, the incidence seemed peculiarly high in publicans and barmaids.

## (b) Trauma

(14)

As admitted by most observers, an accident involving injury to the chest is sometimes the precursor of phthisis. Such a sequence is probably due to the stirring up of a quiescent focus of tubercular disease. In all there were ten instances of phthisis following chest trauma in this series. Two of these were noteworthy as the patients developed positive sputa in 1919,after discharge from the army with bullet wounds of the chest.

The part played by trauma elsewhere is of importance only in that lung disease may be due to surgical trauma in the operative treatment of non-pulmonary tuberculosis. "Gassing" during the war led to many cases of suspected phthisis, but as considered elsewhere, the diagnosis was frequently uncertain.

(14)

Otto May - British Medical Journal - 15th December, 1928.  
Norman Tattersale - British Medical Journal - 15th December, 1928.

(c) Types of Chest

In my experience no form or shape of chest is immune to pulmonary tuberculosis. The types of chest described as "phthinoid" are often the result of very chronic disease, including tuberculosis. I have found, however, many such chests to be perfectly healthy.

(d) Previous Lung Diseases

From my investigations, it would seem that bronchitis and broncho-pneumonia are conditions favouring somewhat the development of phthisis; the catarrhal infectious diseases, influenza, measles and whooping cough share in this tendency. 198 of the 1099 cases analysed began in this way, 36 after pneumonia, 83 after bronchitis, 72 after influenza, 6 after whooping cough and one after measles. In the latter two infections, the usual ages of the patients seem to protect against pulmonary tuberculosis, and I find support for this belief in the investigation of Sundal<sup>(15)</sup>. Three cases followed empyema and yielded positive sputa.

(e) Asthma

The presence of asthma is usually considered antagonistic to the development of phthisis, but this is not always so. Eight cases of asthma were complicated by the development of phthisis with a positive sputum. Such cases were usually very chronic.

Lily K. (27 years) suffered from asthma for 8 years. In 1924 her sputum revealed tubercle bacilli. She died in 1927.

(f) Other Diseases

Malaria in 3 instances and typhoid in one instance occurred as precursors of pulmonary tuberculosis. Diabetes occurred twice and congenital heart disease once in the same connection. Influenza plays a role that is difficult to assess. The onset of acute pulmonary tuberculosis is often accompanied by symptoms which are diagnosed as influenza, and in this way the reported frequent origin of the disease after influenza has to be somewhat discounted, except when the latter is complicated by lung disease.

(15)

A. Sundal - Tidsskrift f.d. Norske Laegefor - October 15th, 1931  
p.844

(g) Habits

A great many of the patients notified were beer drinkers, but this habit was universal in the town of this investigation. Nevertheless, it was frequently stated to me that patients had been drinking to excess, immediately prior to the onset of the disease.

Other evil habits, possibly causal, were of a sexual nature, as was illustrated by the frequent development of phthisis in patients living loose lives.

(h) Insanity

Serious mental disorder seemed a common association with pulmonary tuberculosis. Whether insanity was an early toxic symptom, or pulmonary tuberculosis developed after removal to institutions, due to defective hygiene in the latter, I am unable to say definitely, but the recent sharp fall in the incidence<sup>(16)</sup> leads one to suspect the latter cause. Of the total 1564 notifications, 41 referred to inmates of asylums.

Children of tuberculous fathers proved on occasion to be mentally defective or were imbecile, thus indicating the toxic influence of the tubercle bacillus on the germ plasm.

P.R., a school teacher, was discharged from the Navy with Pott's Disease of spine in 1919. Multiple non-pulmonary lesions developed as well as chronic pulmonary tuberculosis. He had two children, a girl born in 1916, and a boy born in 1923. The former was extremely clever and won a scholarship, while the latter was a hopeless imbecile.

(i) War Service

The war years and the three years succeeding it saw a temporary increase of notifications of phthisis. Nevertheless, this did not affect only males. Observation of the case histories of ex-service-men, who were dealt with as tuberculous, showed that phthisis was only too often the scapegoat for pension-seeking and malingering.

<sup>(17)</sup> This opinion is confirmed by many observers elsewhere. The fibrosis of the lungs and chronic bronchitis so often following "gassing" were universally badly diagnosed and labelled phthisis. Malingerers included those who stole samples of phthisical sputum and presented them as their own, as is suspected of an ex-R.A.M.C. sergeant, notified in this series, but who actually suffered from syphilis.

<sup>(16)</sup> Report on Tuberculosis - Ministry of Health - 1932, p.29.

<sup>(17)</sup> T. Readman, British Medical Journal. 10th Nov.1928.

(J) Child-bearing

The relationship of child-bearing to phthisis is a two-fold consideration, involving firstly the case of the already tuberculous woman who becomes pregnant, and secondly, the rôle of pregnancy in the development of tuberculosis in a healthy woman. A recent (18) questionnaire brought out the general opinion that pregnancy was harmful to the phthisical woman, and that repeated pregnancy often activated a "latent" lesion.

My experience suggests that the woman with open phthisis seldom becomes pregnant and bears a child for the reason that she seldom survives long enough. I find in my records only one case who had a child after such a diagnosis. She did not survive long afterwards.

On the other hand I have records of twenty-six women whose pulmonary tuberculosis was associated with child-bearing as the starting point. In nine of these the symptoms began before labour, in 5 during the puerperium and in 12 during the period of lactation. The diagnosis, however, was made in only one case before labour, five of the cases being diagnosed in the puerperium and the remainder within the succeeding year. All of these cases died within two years of the confinement, with the exception of one woman with open phthisis, who lived for sixteen years before finally succumbing to the disease.

The effect of pregnancy seems to be to throw too great a strain on the defences of the body, with the result that a hidden closed tuberculous lesion breaks down, usually in the later months. I cannot corroborate the view that pregnancy improves the health of tuberculous women. Much of the prevailing opinion on this subject is vitiated by failure to distinguish open and closed phthisis in this relation.

It was noticed that the infants of these tuberculous women were usually healthy.

(18)

Leyland Robinson - Journal of Obstetrics & Gynaecology, 1931 - p.338

The view is often expressed that non-pulmonary lesions tend to immunise against pulmonary disease. The records in Burton-on-Trent showed that such cases were just as liable, to say the least, to develop pulmonary tuberculosis as the healthy. Intervention by the surgeon seems, on occasion, to be followed by a spread of the disease to the lungs, and the fact that a non-pulmonary lesion is quiescent, arrested, or apparently cured, does not render immunity certain.

There were notified thirty-two cases of pulmonary tuberculosis following other tuberculosis. The original lesions of these were as follows:- Bones and Joints (including spine) - 16, Glands - 12, Lupus - 3, Epididymis - 1.

The frequency of lupus is rather surprising. Sir. Wm. McEwen taught that this lesion certainly immunised against phthisis.

Examples:-

Mrs. M.(48) in 1924 suffered from cervical adenitis after influenza. A year later she developed a cough, and sputum examination revealed tubercle bacilli.

Annie W.(19) in 1925 had cervical glands excised after medical treatment for 2 years. In 2 months she developed a cough. The sputum was positive.

Thos. H.(43) in 1918 had testis removed by operation. In 1924, he developed a cough and hoarseness and died in 1927 of chronic phthisis with a positive sputum.

The following case is of interest in this connection:-

Geo. N.F.(30) was discharged from the army well. After the war he returned to his former post as asylum warder. He developed a post-mortem wart (Verruca Necrogenica) on his finger and later pulmonary tuberculosis with a positive sputum. He died finally of generalised pulmonary tuberculosis with the wart still present, in spite of repeated cauterisation.

#### (1) Conditions antagonistic to phthisis

Heart disease of the acquired variety seemed to be definitely against the development of phthisis. No case of such a coincidence occurred in this series.

Another striking feature was the absence of myopia among the subjects of pulmonary tuberculosis. Such cases would be easily recognised by the diminishing effect of the spectacle lenses on the apparent size of the pupil and eyelids. Other eye defects were frequently noted, such as hypermetropia, with and without squint, and presbyopia, but I cannot recall ever seeing a tuberculous myope. It is not so strange, therefore, that Jews, who are relatively prone to myopia, should be also relatively insusceptible to phthisis.



D. - Tuberculin Tests and Their Etiological Significance.

The weakness of these tests is their inability to distinguish between bovine and human infection, and between active, arrested and healed disease. The universality of milk infection with bovine tubercle bacilli is, in my opinion, responsible for the high percentage of human reactors to tuberculin quoted in all statistics. This finding is the basis of the theory, originally propounded by Koch, that pulmonary tuberculosis develops from infection early on in life, latent for many years and bursting forth in adolescence or adult life. I cannot but regard this as a rather preposterous theory, which neglects altogether the fact that pulmonary tuberculosis is a progressive disease. Much more likely is the view that pulmonary tuberculosis is most often the anaphylactic reaction to infection from human sources on the part of a human already sensitised due to past infection with bovine bacilli. The anaphylactic tendency would then be the unknown factor transmitted by heredity.

This latter theory fits all the facts, for anaphylaxis is by no means a universal phenomenon, as is the experience of those treating diphtheria and other infectious disease with horse serum.

(19)  
Martin in a recent paper seems to regard human and bovine bacilli as identical, but modified by years of sojourn in a definite habitat and nevertheless capable of changing in type. There is, however, no evidence of such change, and until disproved the theory I uphold seems the best explanation of the development of tubercular disease in the lungs.

(19)  
Burrell L.S.T. - Recent Advances in Pulmonary Tuberculosis - p.2.

(20)  
Martin J.M. - Factors in the Problem of Tuberculosis -  
British Medical Journal, 9:1:32.

# THE SYMPTOMS OF PULMONARY TUBERCULOSIS.

So well known are the main symptoms of this disease that they require little more than mere recapitulation. The early symptoms demand attention nevertheless. A summary of the symptoms first noted by the individual patients in this series yielded the following, (21)  
a result very similar to a like analysis by Wingfield.

Cough - all kinds .....	787
Haemoptysis .....	93
Pain in chest (pleurisy).....	78
Failure of general health.....	59
Hoarseness .....	29
Digestive symptoms - .....	23
nausea & vomiting ..15, anorexia..2	
diarrhoea..2, abdominal pain .....	4
Dyspnoea.....	11
Asthma .....	8
Amenorrhoea.....	3
Night sweats.....	3
Fainting.....	2
Dental sepsis .....	1
Pneumothorax (spontaneous).....	1
	<u>1098</u>

It is well known that phthisis may begin in many diverse manners, but in these cases, chest symptoms always appeared early in the disease. Cough may have been very slight and not at first evident to the patient as a departure from the normal. The case recorded as commencing in dental sepsis is the best example of this.

L.H. aged 47 had a dental abscess. A day or two after extraction of the tooth, he noted that he had occasionally to clear his throat of some mucus, and asked his doctor to have this examined, with the result that tubercle bacilli were found in the specimen. He was otherwise symptomless, and no signs of disease were evident in the chest.

In the main, these early symptoms are expressive of a toxic chest condition, but the difficulty is to correlate certain of the digestive symptoms with the origin of phthisis, unless they be of toxic origin. Sometimes the abdominal crisis is so acute that gastric ulcer or appendicitis is diagnosed, as occurred in four of the cases under survey.

Of great importance in phthisis is the rate of the pulse. In all but the slightest cases this was accelerated when the case was first seen, and this effect is toxic. Indeed throughout the illness the pulse rate is invaluable as an index for controlling treatment.

(21)  
Wingfield R.C. - Text Book of Pulmonary Tuberculosis, 1929 - Ch.VII.

The symptoms otherwise occurring in pulmonary tuberculosis were variable according to whether the local or general effects of the disease dominated the clinical picture. Among local symptoms during the course of the disease, one noted pains in the chest, repeated "colds", dyspnoea, asthmatic paroxysms, and haemoptysis. Complications gave rise to hoarseness and diarrhoea with infection of larynx and bowel, and urinary disturbances occurred with cystitis. Toxic phenomena included lassitude, chill, night sweats, debility, loss of flesh, *spes phthisica* and delirium, while amenorrhoea was the rule sooner or later in women of child-bearing age. Anorexia was a late symptom, but both this and abdominal pain occasionally occurred very early. Mental disturbance was common. Most of the phthisical patients were difficult to handle and required to be humoured. Suicidal tendencies were not unknown. The onset of cardiac failure was marked by varying degrees of dyspnoea and oedema of the ankles.

Toxic phenomena tended to predominate in the acute types, and local symptoms in the more chronic.

Intercurrent infections such as influenza and broncho-pneumonia were badly borne, and often led to an immediately fatal issue, while meningitis and acute miliary tuberculosis were always liable to supervene.

# PHYSICAL SIGNS OF PULMONARY TUBERCULOSIS.

Commencement of the tuberculous lesion in the lungs leads to a consolidation of the spongy tissue with perhaps an alteration in note and breath sounds. The subsequent progress, if accompanied by breaking down of lung tissue, causes the appearance of moist crepitant râles over the affected site, unless there be pleural effusion or thickening or, more rarely, pneumothorax. Unaccompanied by these latter, the pulmonary lesion tends to spread gradually through the lungs, first invading more and more of the affected lobe, and in succession, the other lobe or lobes of the same side and those of the opposite side. These pathological processes manifest themselves by exacerbation of the primary signs, altered percussion note and breath sounds with added moist crepitations. Excavation of lung tissue gives rise to moist râles with the peculiar clicking character typical of the disease. Simultaneously the more chronic lesions alter the shape of the chest and the position of the organs, and atrophy of the chest muscles of the affected side becomes evident.

It is my experience that the muscular defects and the other signs, best described by Crocket, which are evident on inspection of the individual were of late appearance in the disease. Inspection, palpation and percussion were of great help in the diagnosis of the lesions, but most information was obtained by auscultation, although I am quite well aware that this view is contrary to that of many authorities. It has to be remembered here that most men are not so gifted in their senses as to appreciate minor variations in muscle tone or distinctions in pitch of percussion note, but most medical men can hear, and the use of the binaural stethoscope effects a mental concentration on the auscultatory sounds, which makes this the mode of examination most suited for the average practitioner.

The early signs in a series of 247 cases of notified pulmonary tuberculosis examined by me at the time of notification are given in summary form. Both lungs suffered equally as the initial focus. In a number of cases the signs were indefinite or entirely normal.

(22)  
Crocket - Physical and Radiological Examination of the Lungs.  
(Lewis) 1931.

Physical Signs evident in 247 cases of alleged Pulmonary Tuberculosis  
at time of Notification

Signs	T.B.+	T.B.-	Not T.B.
1. No abnormal physical signs	12	7	17
2. Indefinite physical signs	1	9	3
3. Crepitations at one upper lobe			
a - right	13	6	2
b - left	12	3	1
	25	9	3
4. Altered breath sounds at one upper lobe			
a - right	8	-	-
b - left	4	-	1
	12	-	1
5. Altered breath sounds and crepitations at one upper lobe			
a - right	14	-	2
b - left	17	1	-
	31	1	2
6. Cavity at upper lobe			
a - right	2	-	-
b - left	-	-	-
	2	-	-
7. Gross signs over entire lung			
a - right	15	-	-
b - left	13	2	-
	28	2	-
8. Cavity at upper lobe with signs at lower lobe			
a - right	2	-	-
b - left	1	-	-
	3	-	-
9. Dry pleurisy			
a - right	4	3	-
b - left	2	-	-
	6	3	-
10. Pleurisy with effusion			
a - right	3	3	-
b - left	4	2	-
	7	5	-
11. Signs over entire lung and opposite upper lobe			
a - right	5	-	-
b - left	8	1	-
	13	1	-
12. Signs over entire lung and opposite lower lobe			
a - right	-	-	-
b - left	1	-	-
	1	-	-
13. Signs at lower lobe only			
a - right	-	2	2
b - left	2	4	1
	2	6	3
14. Signs at both lower lobes	1	4	4
15. Signs over both lungs	11	6	4
16. Signs of bronchial glands	-	2	-
	155	55	37

N.B. - T.B.+ = open phthisis: not T.B. = not tubercular.

The occurrence of pleurisy, dry or with effusion, although a complication, is so very frequently the earliest sign of phthisis that it is noted here that roughly one-tenth of all the cases notified gave this as the initial complaint.

My experience of these cases and of many more outside this series (23) leads me to agree with Fishberg that the lesion of active phthisis commences as a rule in the upper lobes at a point below the crossing of the clavicle. Indeed Fishberg almost goes so far as to deny the (23) (Fishberg) Apical and Subapical tuberculosis - British Medical Journal Aug. 24th 1929 - p. 331

early apical ( i.e. supraclavicular) lesion any pathogenicity at all.

Radiological diagnosis of tuberculosis of the lungs has been disappointing in my experience. There is often ample evidence that the lungs are not normal, but the problem as to whether the abnormal shadows are due to tuberculosis or not is often difficult to solve, and if thought to be the latter, still more difficult is it to say whether the tuberculosis is active or quiescent. Many of the cases diagnosed by X-ray are not tuberculosis at all, and this experience (24) is in accordance with the opinions of most authorities. Nevertheless, utilisation of the X-rays in determining the extent and progress of known disease, gives the radiologist a much more useful field. Much improved radiography as compared with that usually available at present is, however, greatly to be desired.

(24)  
Dickson - W.A. - Diagnosis and Treatment of Pulmonary Tuberculosis -  
British Medical Journal, 1:3:30 - p. 376

(24)  
Royal Society of Medicine, 20:11:31, - Discussion - X-ray Diagnosis  
of Diseases of Chest.



# SPUTUM EXAMINATION

There were examined in Burton-on-Trent 1,894 specimens of sputum, and I can therefore say quite definitely, that there is no absolutely typical sputum in pulmonary tuberculosis. A definitely mucopurulent sputum free from odour was most likely to reveal tubercle bacilli, but even the most unlikely sample was found on occasion to be full of tubercle bacilli. The most infectious sputum met with consisted of saliva, in which tubercle bacilli were present in enormous numbers, while cells were very scanty. This was derived from a case of chronic phthisis with signs of cavity formation. Of 146 sputa found positive for the first time during this period, 138 showed the presence of tubercle bacilli on the first examination, 6 on the second examination, one on the third examination, and one on the fifth examination. This is an even higher percentage positive at first or second examination than that given by Burrell. (25)

It is often stated that the presence of blood renders the finding of tubercle bacilli in sputum unlikely, even where the haemoptysis is due to evident tuberculosis. In my series, of 14 specimens of sputum which consisted almost wholly of blood, 4 showed the bacilli on examination. Of the latter, two were from early cases, and two from advanced, as judged by the signs evident. (26)

Concentration tests are sometimes advised, notably by Dixon. My experience with these was not fortunate. When bacilli were found in the ordinary smear from the sputum, they were certainly more evident in the concentrated specimens. An attempt was made to compare four methods on different samples of the same sputa, already known to be positive. By this test one showed that Ellermann and Erlandsen's method was relatively the most efficient, the anteformin method slightly less efficient, while the efficient, the antel Pane were of relatively little use. Having determined this result, this method of Ellermann and Erlandsen was practised on 82 sputa, negative on examination of ordinary smears and derived from cases in whom/ (25) L.S. Burrell - Mitchell Lecture R.C.P., London, Nov. 13th, 1930. (26) G.B. Dixon - Annual Report of Tuberculosis Officer - Birmingham, 1918. (27) G.B. Dixon - ibidem - 1918. (28) Pane - Lancet - 27:5:22.

there was clinically a reasonable possibility of pulmonary tuberculosis. By these concentration tests all were found still negative so far as tubercle bacilli was concerned, but the peculiar detritus left on the slide decolorized badly, and mistakes might easily be made by mistaking some of this detritus for acid fast bacilli.

I have reason to believe that this mistake had been made in six such cases, for careful following up five years afterwards showed that none had ever had any definite clinical signs, nor developed sputa positive on examination of the ordinary smear.

For these reasons, I am forced to the opinion that the best method of finding the bacilli is by the staining of ordinary smears, taken repeatedly from different samples of sputum from a suspected case. The Ziehl-Neelsen technique too proved the best in my hands, and was the simplest. At least three samples of sputum should be examined carefully at intervals, when dealing with a suspect who expectorates pulmonary material, before a negative result is finally recorded by the diagnostician. This dictum finds concurrence in recent opinions expressed by other Tuberculosis Officers. (29)

In ordinary smears, the finding of tubercle bacilli entangled together in bunches was associated with marked cavitation in the lungs.

Tubercle bacilli are seldom found in the case of suspects below the age of ten years. Although many thousand samples have been examined in Burton-on-Trent, scrutiny of the records show that the youngest cases of open phthisis were 7 and 9 years of age respectively. Four children aged 11 years, and one aged 12 years likewise had positive sputa. The 7 year old case is of interest:-

H.G. - At Christmas 1927, this boy suffered from a severe acute bronchitis. He was sent home by me from school to have treatment by his own doctor. An interval of six months elapsed, and he was seen in consultation by me. By this time he had advanced signs of tuberculosis over his left upper lobe, but the remainder of the lungs was apparently healthy. His sputum was positive. The disease ran a chronic course with exacerbations, and death occurred 3 years after the onset of the disease. His doctor had treated the boy with ultra-violet ray exposures for a considerable time in the spring of 1928, and in my opinion this had much to do with the development of the disease.

(29)

Lissant Cox - Report of Central Tuberculosis Officer - Lancashire,  
B.G. Nicholson - British Medical Journal (1930, p.95.)  
31st March, 1928.

(30)

Recently Marrett has drawn attention to fungoid organisms in the sputum. I have seen these both in phthisical and in non-phthisical sputa, and I cannot agree that they are of any importance. The author concludes that since 1922, when attention was paid to the presence of these bodies in phthisical sputa, and attempts were made to get rid of them, the phthisis death-rate has fallen continuously. This last feature, however, has occurred everywhere apart from such a practice.

## COMPLICATIONS OF PULMONARY TUBERCULOSIS

Many of the complications ordinarily ascribed to pulmonary tuberculosis are really of the nature of common symptoms. Pleurisy, spontaneous pneumothorax, laryngeal and intestinal ulceration were very common accompaniments of the disease due to local extension. Other less common tubercular lesions noted as complications in this series were cervical adenitis, cystitis, joint disease, epididymitis and meningitis. Two cases with extreme vertigo occurred and this was thought to be due to a tuberculous lesion of the brain.

Complications due to exaggeration of common symptoms were also noted. The exaltation of spes phthisica was sometimes replaced by melancholia, and certification was occasionally required. Suicide (31) occurred in three instances. Bannister in an informative article dealing with this aspect of the disease comes to the conclusion that such mental aberrations are the result of associated anxiety neuroses rather than symptoms of the disease.

Haemoptysis of a sudden severe nature occurred while patients were going about, and in two cases was fatal within a few minutes. Abdominal pain was occasionally extreme and led to operative treatment before the chest condition was diagnosed.

### Illustrative cases

1. Geo. D. aged 38 suffered from chronic phthisis for ten years. In 1928, he was admitted to the sanatorium but failed to settle down and was discharged. On the evening of discharge, he was found dead with his head in a gas oven.
2. J.S.E. aged 32 - this patient, an ex-soldier, had pneumonia in 1926. In 1927 he lost his youngest child from tubercular meningitis; a year later he was discovered to suffer from open phthisis. A year's treatment in sanatorium followed, and he resumed his work as a railway clerk. In October 1930 he had a sudden large haemoptysis while at work, and died in the booking office of a busy station within a minute or two.
3. Wm.C. aged 22 was operated on in 1923 for appendicitis and in convalescence was diagnosed as phthisis, to die a year later of that disease.
4. Ada C.R. aged 45 suffered from gastric ulcer for 2 years prior to diagnosis in 1925 as a case of open phthisis and died 9 months after notification. - I do not think the original diagnosis was correct.

Among complicating diseases, there occurred ischio-rectal abscess and anal fistula in 7 cases. I have seen both conditions in the non-tubercular, so that these are not specific to phthisis. Deafness was extremely common in the phthisical, but to what extent this was due to phthisis I could never elicit. Otitis media was noted in a few cases, but was seldom the cause of this deafness. Tinea versicolor occurs rarely nowadays, although I have seen one or two examples among the chronic types. Diabetes occurred in 4 cases.

A case complicated by albuminuria is most interesting:-

J.H.A. aged 21, was invalided out of the army in 1916 with open phthisis. He had extensive disease of the right lung and frequent haemoptysis. His weight fell as low as 9 st. 7 lbs. while under treatment. In 1918, he was first noted to have albuminuria, and from this time onwards he got stouter each day, and his toxic manifestations disappeared (although his lung signs remained). In 1922 he weighed 12 st., and in 1928 15 st. In 1928 he had cavities in both lobes of the right lung and signs in his left lung, but his sputum then was negative. He died suddenly in 1929 of hemiplegia due to cerebral haemorrhage.

Among the phthisical it is rare to see a healthy mouth. Most of these manifested severe dental caries or pyorrhoea, and these conditions when present were usually entirely neglected.

HEALTH OF CONTACTS OF OPEN PHTHISIS

Much attention has been given of late to the health of domestic contacts of phthisis, not only in regard to the spread of tuberculosis but also in regard to their general health. Neglecting altogether the "contacts" already noted as developing phthisis, a survey of the notification records showed that only 28 contacts of open phthisis were notified as suffering from non-pulmonary tuberculosis during the years 1912 - 1930. The lesions were as follows:-

Meningitis.....	11
Joints .....	8
Generalised.....	
(i.e. multiple lesions).	2
Peritonitis .....	3
Glands .....	2
Lupus .....	2
Total ... ..	<u>28</u>

The cases of meningitis noted were infants and children of tender years. Their deaths were often anterior to the diagnosis of pulmonary tuberculosis in the adult inmate of the same house.

In 1924, W.H.G. aged 1 year died of tubercular meningitis. In 1925, the child's father, Herbert G. had pleurisy with effusion but recovered and was able to do his work until the end of 1927 when his pleurisy recurred and his sputum was found positive. The father improved under treatment and became a "fibroid phthisis" with little toxæmia. In 1928, a daughter Muriel, aged 15 years, developed phthisis, and in 1929, a son, aged 21 years, had hæmoptysis with tubercle bacilli in the expectoration.

On the other hand, the health of the great majority of the contacts has been quite satisfactory and my opinion is that the sole risk they run is the development of tuberculosis as the result of massive dosage with tubercle bacilli.



## THE PROGNOSIS OF PULMONARY TUBERCULOSIS

The immediate outlook in notified pulmonary tuberculosis depended first of all on whether the sputum contained tubercle bacilli or not, and thereafter on a number of additional factors. Age, occupation and habits certainly did influence prognosis, but the main subsidiary prognostic element was the type of disease present, which was best judged by way of symptoms and signs. Fever, tachycardia, and a large daily quantity of expectoration (half an ounce and upwards) were of evil import, especially when unimproved by rest. On the other hand, with appropriate treatment, most cases became afebrile, the pulse rate falling to normal, and the volume of daily expectoration declined greatly. The immediate results of a regime of absolute rest in bed in the open air would lead one to hope for ultimate recovery in most of the cases so treated, but this was rarely the result attained in open phthisis, although frequently it was the effect of such treatment in those cases where the sputum was negative. In my experience, only a few of the open cases of phthisis became healthy enough to be called "cured". Some others lived for years in a symbiotic way with tubercle bacilli in their lungs, but seldom causing toxæmia. By far the majority of the open cases died within a few years.

In the category of patients called "doubtful", the prognosis is uniformly good, and ultimate cure is frequent.

Taking first of all the table given previously, showing the annual incidence of notified pulmonary tuberculosis, and noting the fate of these cases, the accompanying table results, clearly demonstrating the foregoing statement.

Burton-on-Trent, 1912 - 1930

FATE OF ALL GENUINE AND DOUBTFUL NOTIFIED  
CASES OF PULMONARY TUBERCULOSIS /

Burton-on-Trent, 1912 - 1930

FATE OF ALL GENUINE AND DOUBTFUL NOTIFIED

CASES OF PULMONARY TUBERCULOSIS

Year	- Genuine cases -				- Doubtful cases -			
	Died.	Cured.	Lost sight of.	Disease still active.	Died.	Cured.	Lost sight of.	Disease still active.
1912	113	9	12	-	1	5	3	-
1913	65	4	7	1	1	8	2	-
1914	69	8	10	-	-	6	1	-
1915	72	5	13	1	-	8	-	-
1916	79	4	11	2	-	5	1	-
1917	51	12	9	2	-	5	-	-
1918	55	11	10	-	2	11	-	1
1919	50	7	11	1	2	16	2	1
1920	54	13	10	2	1	6	1	3
1921	60	-	8	-	-	9	3	1
1922	45	7	9	2	-	6	2	-
1923	44	1	6	-	2	1	-	-
1924	33	-	11	4	1	1	1	1
1925	49	1	7	16	1	1	1	2
1926	31	2	9	10	-	-	-	4
1927	42	4	8	9	-	2	1	-
1928	26	1	5	12	-	-	1	1
1929	19	-	4	11	-	-	-	1
1930	12	-	5	17	-	-	-	2
Totals.	969	87	165	90	11	90	19	17

Investigation of the effect on prognosis of the condition of (32) the sputum must be referred to and the results are surprising. Of cases on the register, 467 cases of closed phthisis when followed to the end of 1930, showed 179 dead, 151 cured, 34 still suffering, and 103 lost sight of. On the other hand, 539 cases of open phthisis were classified into 421 dead, 16 cured, 70 still suffering, and 32 lost sight of.

A more detailed analysis of open phthisis was made, and I give the results in the table appended. This table in effect means that only 21 individuals out of 539 notified will probably recover from the disease and that nearly four fifths of open phthisis is fatal within four years. In the L.C.C. report on cases discharged from institutions in 1925, similar findings are evident. 2204 deaths occurred within 5 years among 3010 cases of open phthisis treated in 1925, and this in the one part of the country where the latest and best methods of institutional treatment are available.

(32) N.B. Many of the earliest notified cases were unclassified into

(33) T.B.+ and T.B.- groups.

British Medical Journal, 24:11:31

Date of All T.B. + Cases.

Notified.	Dead in years														Alive 1931				GRAND TOTAL.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cured.	Disease active.	Disease arrested.	Lost sight of	
1912	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7
1913	8	3	1	0	0	1	0	0	0	0	0	0	0	0	0	2	0	1	16
1914	7	6	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	16
1915	12	8	4	1	1	1	2	0	0	1	0	0	0	1	2	1	0	2	36
1916	18	5	7	2	0	2	0	0	0	0	1	0	1	0	1	1	0	1	39
1917	8	9	3	0	1	1	1	0	2	0	0	0	0	0	6	1	0	1	33
1918	19	4	2	1	1	0	0	1	0	0	0	0	0	-	3	0	0	2	33
1919	9	4	3	1	1	0	0	0	1	0	0	0	-	-	1	0	0	3	23
1920	17	7	1	1	1	2	0	1	0	0	0	-	-	-	1	1	0	1	33
1921	12	5	2	2	1	0	0	1	1	0	-	-	-	-	0	0	0	1	25
1922	17	5	3	2	0	0	0	0	1	-	-	-	-	-	1	2	0	2	33
1923	14	5	0	1	1	0	0	0	-	-	-	-	-	-	0	0	0	1	22
1924	9	6	1	2	0	0	0	-	-	-	-	-	-	-	0	3	0	2	23
1925	23	8	6	3	1	0	-	-	-	-	-	-	-	-	1	9	0	1	52
1926	8	5	6	3	0	-	-	-	-	-	-	-	-	-	0	5	3	5	33
1927	15	5	4	0	-	-	-	-	-	-	-	-	-	-	0	8	0	2	34
1928	12	5	2	-	-	-	-	-	-	-	-	-	-	-	0	8	2	3	32
1929	10	4	-	-	-	-	-	-	-	-	-	-	-	-	0	9	0	2	25
1930	7	-	-	-	-	-	-	-	-	-	-	-	-	-	0	14	0	3	24
	228	96	46	20	8	8	3	3	5	1	1	0	1	1	16	65	5	32	539
Totals									421						16	.....70.....		32	539

Eight of the sixteen cured cases of open phthisis have been under my care. Four were males and were army pensioners. In all these, signs of tuberculosis in the lungs were lacking, symptoms were slight and limited to cough and slight fever, and the diagnosis was made by sputum examination. None of these carried out laborious work. The four females were similar in history and condition, and did only light housework. In none of these cases would I be surprised, however, to hear of a sudden reactivity of the lung, as happened in two cases previously considered to be cured, who relapsed and died of acute broncho-pneumonic phthisis.

Alice A., aged 41 years, was found to have a positive sputum in 1916. The chest signs were few and she made an excellent recovery, going off to domestic service in Cambridgeshire thereafter. In 1930, she was considered "cured", remained well until 1930, when she relapsed, was found to have widespread infection of both lungs and a positive sputum. Despite sanatorium treatment, she died in six months.

The seventy open cases alive in 1930 and not considered as "cured", were all under my care. Five of these classified as "disease arrested" had neither sputum nor signs of a lesion in the chest, nor symptoms of toxæmia. All had indefinite clinical signs at the time of notification more than five years before. After sanatorium treatment the sputum became negative or disappeared, and there had been no return of bacilli. Two of these contracted the disease from other open cases and improved rapidly with a change in environment. Only one of these was fit for work, namely a married woman with a small family.

The remaining open cases, classified as "disease not arrested", were characterised by much fibrosis of the lungs and by widespread signs. They seemed to suffer more from the local condition than from any toxæmia. Cavitation with much pleural thickening was evident on examination of the chest. This group of cases was a source of great danger to others, and contact infection occurred in many instances, e.g.:-

T.C. aged 26 was notified as suffering from open phthisis in 1915. His condition has gradually deteriorated since, but as a rule he is able to go about but not to work. Since notification two children have died from tuberculosis, and a third suffers from the disease.

The influence of accessory factors in the prognosis of open phthisis does not seem of much account. Certain of these, to my knowledge, drank and dissipated, but without any obvious harm.

J.G. aged 39, a cooper, was found to have a positive sputum following an attack of hæmoptysis in 1925. He had five months treatment in sanatorium, and resumed work on leaving. Since then he has worked steadily, the signs in his chest became less evident, and this in spite of the fact that he was always drunk when he came to the dispensary for examination.

Age did not influence the prognosis to any extent. The long-lived phthisis cases were distributed throughout all the age groups.

The prognosis of closed tuberculosis is very difficult. In thirteen cases with negative sputa for a considerable time, open phthisis developed, and in seven of these after a period of five years had elapsed/

subsequent to notification. The longest period noted was ten years after the original notification.

Contacts of open phthisis notified as tuberculosis in the strength of symptoms, but with absence of signs and bacilli in the sputum, generally do well, but one is always in doubt as to whether they should have been notified at all, as treatment does not markedly influence the after history.

Other cases of closed phthisis, i.e., those with bronchial glands, emphysema, fibrosis of lungs, etc., did well. The fatal types were those in whom the tuberculosis was miliary, or broncho-pneumonic, as in children.

Pleurisy, either dry or with effusion, means a good prognosis, unless a positive sputum results. In one case, such a complication developed eight years after the initial attack. The type of wet pleurisy which is prone to give a bad ultimate result, is that with very slow absorption of the fluid and much thickening of the pleura.

Haemoptysis affected the prognosis according to the presence or absence of tubercle bacilli. Several cases of haemoptysis never developed any subsequent conclusive signs of phthisis, and very possibly were not due to this cause.

-35-  
ERRORS OF DIAGNOSIS

An analytical survey of cases notified as suffering from pulmonary tuberculosis and proving to be wrongly diagnosed, or extremely doubtful cases, is most instructive and quite comparable with the experience of other authorities. (34)

Local conditions of chest

Chronic bronchitis.....	25	Bronchial asthma.....	5		
Delayed resolution of pneumonia.....	11	Acute bronchitis.....	4		
Chronic cough in childhood.....	11	Empyema.....	4		
Cough in contacts.....	9	Broncho-pneumonia of children.....	3		
Bronchiectasis.....	8	Chest injuries.....	3		
Non-tuberculous fibrosis of lungs.....	6	Chronic laryngitis.....	3		
	<u>70</u>	Gangrene of lungs.....	1		
			<u>23</u>		
			<u>70</u>		93

Conditions causing haemoptysis

Acute bronchitis.....	6	Other.....	3		
Heart disease.....	6				
	<u>12</u>		<u>3</u>		
			<u>12</u>		15

Tuberculosis elsewhere

Abdominal tuberculosis.....	5	Genito-urinary tuberculosis.....	1		
Glandular tuberculosis.....	1		<u>1</u>		
	<u>6</u>		<u>6</u>		7

General conditions

Debility of congenital origin.....	44	Vague illness.....	5		
Debility following illness.....	14	Anaemia.....	2		
	<u>54</u>		<u>7</u>		
			<u>54</u>		65

Other diseases

Chronic nephritis.....	3	Gastric ulcer.....	2		
Malignant disease.....	2	Post-diphtheritic palsy.....	1		
Syphilis.....	2	Prolapse of womb.....	1		
Myocarditis.....	1	Hemiplegia.....	1		
Oesophageal stricture.....	1	Congenital heart disease.....	1		
Lymphadenoma.....	1		<u>1</u>		
	<u>10</u>		<u>6</u>		
			<u>10</u>		16

Healthy

Malingerers.....	6	Mistake in report on sputum.....	1		
Healthy persons.....	4		<u>1</u>		
	<u>10</u>		<u>10</u>		11

Total..... 207

(34)  
Chandler F.G. - Conditions simulating tuberculosis of the lungs -  
British Medical Journal - Oct. 19th, 1929. p.706.

Spurious histories of contact were common in this series of wrong diagnoses. Five families had three or more individuals notified as suffering from phthisis, although not one of them died from the condition nor manifested positive sputa. After the notification of the first case in each family, the practitioner would be reminded upon the subsequent illness of a brother or sister that there had been consumption in the family, a suggestion which often led to the inclusion of such a patient in the benefits of a scheme designed to aid the truly phthisical.

On the other hand, notification was extremely tardy in many instances, where the patient tried to fight the disease and sent for the doctor when vanquished by it, and where the patient suffered from a condition such as pleurisy, months or years before notification.

C.J.B., aged 52, a compositor, had a cough and sputum for more than a year, accompanied by a loss of flesh. He came to the dispensary, having diagnosed his own illness, and asked for treatment. He died ten months after this visit of ulcerative phthisis, but meantime it was evident that he had most probably infected a fellow worker.

In my experience the significance of haemoptysis and pleurisy is often not given due weight by physicians, and little enough trouble is taken to secure early sputum examination. Haemoptysis, however, is sometimes so severe at the onset of the illness that haematemesis is diagnosed and the patient treated for gastric ulcer. The following case occurred in my own experience:-

John W., aged 29, a labourer of fine physique, had a severe loss of blood by the mouth in 1929. He was seen by his doctor some hours afterwards but the blood had been disposed of by the patient's wife. No signs were audible in the chest, and although there was a very slight cough, no other symptom was evident. He was given sanatorium observation and the small quantity of mucus expectorated in the morning examined several times for tubercle bacilli with negative results. The patient was sent home apparently well without cough or sputum, and free from other signs or symptoms and the opinion that the haemorrhage had really been of gastric origin. One year later the patient was re-admitted in the last stages of acute broncho-pneumonic phthisis, and died in a few weeks.

Many wrongful notifications were due to errors of judgement, largely brought about by insufficient or incomplete examination and consideration of the available evidence, but some errors were made deliberately, either in order to secure for the patient the advantage of sanatorium treatment or a pension for his chest condition, or to get the patient off the hands of the notifying practitioner.

Further, many errors would have been avoided had the sputum been sent for examination, and similarly, if a complete physical examination had been made. Nevertheless, some cases must have afforded great difficulty, and among these, chest symptoms occurring in contacts of open phthisis often left room for insoluble doubt as to the nature of the illness. Tuberculosis of the bronchial glands, so difficult to diagnose, and equally difficult to exclude, is the best example of such conditions. Again debility in children (which gives rise to what is officially known as the "pretuberculous" child) lends itself to easy notification as pulmonary tuberculosis, and gives rise to similar doubt.

Nevertheless, among the diseases mistaken for phthisis were such conditions as post-diphtheritic palsy, prolapse of the womb, and hemiplegia, facts which are difficult to believe and more difficult to explain.

Mrs. G., aged 27 years, attended the out-patient department of a Birmingham Infirmary for treatment of prolapse of the womb. She was seen by a house surgeon who as a result of one physical examination notified the case as pulmonary tuberculosis, of which there has never been any suggestion either before or since the notification.

A really difficult case showing how far tuberculosis can be mimicked is included here.

Miss B., aged 32, developed chest symptoms in 1929 along with hoarseness and sputum. The latter revealed no tubercle bacilli. Nevertheless, she was notified as phthisis and admitted to sanatorium for observation. There was evening pyrexia of 99°F. and a very rapid pulse. The left upper lobe was dull to percussion and showed bronchial breath sounds. The progress of the condition subsequently left no doubt that the disease was mediastinal tumour, which ultimately proved fatal.

Malingering among ex-soldiers reached a fine art, and it is even suspected that a positive sputum result was obtained by one individual who was an R.A.M.C. orderly and was discharged as a victim of phthisis, a diagnosis which could never be substantiated in the years following.

A group of symptoms classified under various heads in the table of errors of diagnosis give rise to great difficulty. They occur nearly always in children or adolescents but are prolonged into adult life. The conditions are included under the heads of/

(35)  
Annual Reports of Chief Medical Officer, Board of Education.



of/

"chronic cough in childhood", "non tubercular fibrosis", "delayed resolution of pneumonia", "debility following illness," and take the clinical form of debility of varying degree with some suggestion of chest disease, but never with a positive sputum. These conditions react well to sanatorium or hospital treatment by simple rest in bed. As a rule, the symptoms are, however, extremely prone to recur. All of these cases have some damage to the lung, which is of the nature of a localised fibrosis, so that there is some excuse for finding signs in the chest indicative of pulmonary tuberculosis, - but these patients usually did too well to be genuine. I cannot (36) but agree wholeheartedly with a recent article on this subject, which stressed the frequency of these conditions after severe measles and whooping cough, and the ultimate curability with efficient treatment. (37) Similar conclusions are expressed in an article elsewhere.

(36)

Kitcat, C. & Sellors, T.H. - British Medical Journal, 16th June, 1928, p. 1018 - 1020.

(37)

Agassy & Gill - Archives of Diseases in Childhood - February, 1928.

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PULMONARY TUBERCULOSIS IN CHILDREN

Inspection of the records in Burton-on-Trent shows that out of 195 children below the age of 16 years notified as pulmonary tuberculosis, the diagnosis was accurate or justifiable in 95 only, that it was exceedingly doubtful in 56, and erroneous in 45 cases.

Of the genuine juvenile pulmonary tuberculosis, 26 showed tubercle bacilli in the sputum, and 18 of these had a definite history of recent intimate contact with an open case of phthisis in the home. The remaining eight included three cases in whom the lesion in the lungs had supervened on bone tubercle. All of these 26 cases are dead, with the exception of 3 still under treatment, but not likely to recover. The age distribution of these cases was as follows, one of 7 years, one of 9, one of 11, one of 12, 2 of 13, and 12 of 15 years. Lung lesions in these cases were well marked, and in some cases limited to the lower lobes. In all of these, the diagnosis had been made in the first place by sputum examination.

Sixty eight of the closed juvenile cases show somewhat different findings upon analysis. Previous contact with open phthisis was limited to 15 cases. Forty one are dead, and 23 are cured, while 4 were lost sight of. The lesions were mostly broncho-pneumonic in character, with miliary tuberculosis, hilum tuberculosis and idiopathic pleurisy as the chief variants. Tuberculous broncho-pneumonia affected the younger children, and was noted after whooping-cough on 4 occasions. Miliary tuberculosis supervened on 6 bone lesions.

The 56 juveniles classified as doubtful all made perfect recoveries from their illnesses with two exceptions. Eighteen were contacts of open phthisis with slight cough or a delicate constitution. Varying degrees of cough and debility occurring in a further 29 cases were diagnosed as of tubercular origin. The diagnosis may also have been justified in 4 children with chronic cough after whooping cough, in 2 children with dry pleurisy, and in/

a further 3 with signs of bronchitis supervening on non-pulmonary lesions.

Forty five cases were notified erroneously. Sixteen of these were delicate children with no other disability, 12 had chronic bronchial catarrh, and 5 were convalescing slowly from whooping cough. Other chest conditions account for the remainder, viz:- broncho-pneumonia 3, tuberculosis elsewhere 3, chronic interstitial pneumonia 3, empyema 1, bronchiectasis 1, mitral disease 1.

The above resumé of the notified cases of juvenile pulmonary tuberculosis yields conclusions comparable in their import with the statement of Lissant Cox that 59% of 18,100 children suspected of pulmonary tuberculosis in Lancashire proved never to have had the disease. Newman has also stated his opinion that pulmonary tuberculosis is much too readily diagnosed in children.

Much of this erroneous or careless diagnosis of pulmonary disease in the young is due to the vague fear of latent tuberculosis in the bronchial glands and lungs at this age. "The main problem at these ages is the discovery of active disease in the thorax or abdomen." Errors of diagnosis occur chiefly among delicate children with some permanent lung damage following the acute infections of childhood, and the diagnosis is mainly made upon symptoms, for signs are very scanty. Nevertheless, as pointed out by Young, sanatorium treatment is exceptionally beneficial to these children, and the desire to procure this is often the reason for notification.

A general weighing-up of the evidence shows that pulmonary tuberculosis is rare in childhood, but extremely serious when it occurs, and that bronchial gland and hilum disease are conditions to be lightly regarded even when their presence is definitely proved by symptoms.

(38)

Lissant Cox - 1930 Annual Report of Tuberculosis Officer, Lancashire - p.7

(39)

Newman, Sir Geo. - Annual Report of Chief Medical Officer of Ministry of Health, 1930.

(40)

McNeil, Chas. - Tuberculosis in Early Childhood, British Medical Journal, October, 12th, 1929, p.658.

(41)

Young, F.H. - Chronic Non-tuberculous Infection of the Lungs in children, British Medical Journal, April 2nd, 1932, p.604.

(42)

McNalty A.S. - Report on Tuberculosis - H.M. Stationary Office, 1932.

Burrell L.S. - Transactions N.A. for Prevention of Tuberculosis, 1931, p.147.

Johnston, D.J.G. - Hilum Tuberculosis, British Medical Journal, 24:8:29

Turner, H.M. - Transaction N.A.P.T. - 1931, p.147.

(43)

McPhedran insists that radiology is essential in the diagnosis and supervision of lung tuberculosis in childhood, and with this I concur, with the reservation that clinical signs and symptoms must also be considered.

(43)

McPhedran, F.M. - "Pulmonary Tuberculosis in Childhood" - American Review of Tuberculosis, Vol. XX - No. 4, 1929 .

## T R E A T M E N T

Little is intended to be said on this aspect of the subject of this study save that, as a general rule, the graduated rest and labour under open-air conditions, coupled with the regular intake of food of good quality and quantity - a regime which has come to be known as sanatorium treatment - improved markedly most of the cases studied in this series. Indeed, for the closed tuberculosis case, little else was required and the benefit was permanent. The open case, on the other hand, while benefiting in all respects from this regime, began to go downhill from the moment of discharge, and especially when a resumption of normal life and activity was entered upon. For these cases, speaking in general, there is a necessity for a continuance of the principles of the sanatorium regime at home for a period of at least three years, and longer, should signs of activity of the disease persist. This home treatment will require an intensive skilled supervision. In nearly every case one found that the termination of sanatorium treatment meant a commencement of work, and any good achieved by the former was quickly undone by the latter.

Of the specialised methods of treatment, tuberculin-therapy had been most largely used, and the opinion was formed that the benefits of this were trifling or absent. The secret of success in the treatment of the pulmonary disease is, undoubtedly, rest, both local and general, and collapse therapy, coupled with sanatorium routine, gives effect to this desideratum.

## CONCLUSION

1.

The one important element in the aspects of the disease considered in this study emerges as the presence or absence of tubercle bacilli in the sputum. The etiological, diagnostic and prognostic import mark out the condition of the sputum as the factor requiring most attention in any campaign designed to deal with the suppression of pulmonary tuberculosis. Yet this view is by no means stressed today. Radiology with its heretical central lesions, immunology with its skin tests, pathology with its adherence to latent tuberculosis, and the wide devotion to symptomatology and physical diagnosis have served mainly to obscure this very clear point of view. Almost every expert<sup>(44)</sup> is in agreement that tuberculosis of the lungs is diagnosed much too freely, and without proper consideration of all the data. Time after time, the open phthisis case is permitted to disseminate his bacilli among his own dearest friends, what time the delicate child is radiographed, and, in consequence, declared tuberculous, without the faintest clinical sign of the disease. Between these two extremes all grades occur, and as a result of the working of the present tuberculosis schemes, all are shepherded alike afterwards with sanatorium treatment, dispensary care and home supervision.

The resultant dispersal of effort which should be concentrated in one direction leads to an enormous wastage and leakage in anti-tuberculosis schemes. That all is not well many writers agree.<sup>(45)</sup> The dangerous case of open phthisis, for whom every care and attention is required, and upon whom every preventive measure should focus, is sorely neglected, and has to put up with a life of badly organised charity for himself and his family. In spite of obvious danger, the patient will fight the demon of poverty by returning to work in the conditions under which he broke down, or will relapse into an attitude of pitiful complacency, what time the dependants (the potential fresh cases of the disease) suffer from want of food, clothing and other necessities of life.

<sup>(44)</sup> Fishberg, M. - Pulmonary Tuberculosis, 1922, p.190.

Burrell, L.S.T. - Mitchell Lecture, British Medical Journal, 22:11:30, p 878.

<sup>(45)</sup> Scarse, F.E. - Administrative Problems of Tuberculosis - Public Health, January, 1927.

II.

It is therefore of the utmost importance in any anti-tuberculosis (46) scheme to find out the cases of open phthisis. Mere notification has been something of a failure by reason of the large proportion of sputum-negative cases on the one hand, and the very tardy discovery of the sputum-positive cases on the other. It should therefore be insisted upon that in every case of suspected phthisis, the sputum should be examined early, and if no sputum is available, the "forcing" methods (by expectorant drugs) and in children, the examination of the faeces should be carried out. The earliest cases of genuine pulmonary tuberculosis seen by me were cases with no signs or few symptoms, but with a positive sputum. Haemoptysis, pleurisy and spontaneous pneumothorax are the only other conditions which should merit notification in the absence of sputum in an adult.

It may be argued that thus many very early cases of pulmonary tuberculosis would be missed until the curable stage had passed. This, in my opinion, remains mere theory. Pulmonary tuberculosis as judged by the sputum-positive cases only is a definitely progressive disease, and with very little tendency to cure. The concentration on early diagnosis of pulmonary tuberculosis by slight physical changes, symptoms and radiology has meant too often a misapplication of a label. Patients with old healed lesions in the bronchial glands or lung stroma are as numerous as mankind. There has been a universal tendency to forget that notification applied only to cases "suffering" from pulmonary tuberculosis.

Worse still has been the failing in the past of labelling many conditions of the lungs as tuberculosis, when there are gross changes due to other diseases such as fibrosis following pneumonia. The presence of gross physical signs with a purulent sputum repeatedly negative on examination for tubercle bacilli should entirely rule out a diagnosis of pulmonary tuberculosis.

(46)

Opie - Eugene - Tuberculosis In Childhood, 17th Conference of N.A.P.T., 1931, p.25.

III.

It therefore remains to produce feasible and economical modifications of the present official schemes. Notification should not be merely an opinion of the practitioner but should be restricted to the following individuals:-

- (1) Cases with no sputum available - a. Children with suspected broncho-pneumonic or military tuberculosis.  
b. Cases of pleurisy or spontaneous pneumothorax.
- (2) Cases with negative sputum. a. Cases of pleurisy.  
b. Unexplained haemoptysis.
- (3) Cases with positive sputum.

All other cases at present liable to be notified should be considered as suspects (as they really are). A similar classification of patients is adopted at the Trudeau Sanatorium, New York State, according to Burrell.<sup>(48)</sup>

Sanatorium or hospital isolation and treatment should be compulsory with such notified cases, while those suspected of active disease should be given a period of observation in similar institutions with careful clinical and radiological examination to confirm or dissipate the suspicion, and to ascertain in most cases the correct diagnosis. In all institutions, open phthisis should be kept strictly apart from other cases or suspects.

After discharge from the institution of the case of open phthisis (and this should only be allowed when there is no sputum or only a small quantity containing few tubercle bacilli), the supervision must be intense and definite financial aid given. The best course that I can visualise would be to augment The National Health Insurance or other weekly benefit by grants of money, sufficient, in the case of the married male to maintain the customary family income, in the case of the married woman to hire domestic help or to maintain the single person. Such grants should, of necessity, be payable only on the condition that the patient attended regularly for examination at the tuberculosis dispensary, and carried out all the preventive measures advised. The homes of such notified patients should be supervised regularly by nurses with the view of securing amended habits for the inmates and of watching carefully the health of contacts.<sup>(49)</sup> Any illness in the latter should lead to thorough examination at the dispensary.

(47) Cf. Ward, Ernest - Public Health, 1930, p. 327 - The Campaign against Tuberculosis.  
(48) Burrell - Recent Advances in Tuberculosis, p. 33.  
(49) Cf. Memorandum on Examination of Contacts - Public Health, December, 1930



Notified cases of closed phthisis should receive neither home supervision nor financial help. Such might be left to attend the dispensary periodically.

For the open phthisis case about to recommence work, the use of "night sanatoria" is commendable. Such adjuncts, organised on the lines of reception houses, have been set up recently in Russia. The patient sleeps in the sanatorium at night and returns for his meals, going out, however, to his work and to enjoy his recreation. In this way, more adequate supervision is brought to bear on the case while undergoing the final stage of treatment by graduated labour. Night sanatoria would be applicable even in the existing tuberculosis scheme for the observation of cases returning to work after a period of sanatorium therapy.

IV. The present decline of incidence suggests that on the whole our local authority schemes are working well towards the desired end. - Very little modification is required and if coupled with more intensive effort, our preventive schemes would probably secure the suppression of this disease before the end of the present century.

We know that there are two common sources of infection in tuberculosis, the milk of tuberculous cows and the pulmonary secretion of phthisical patients. Many workers, and most recently (50) Blacklock, have shown that pulmonary disease is practically always of human derivation, and the logical development of this axiom has been suggested in these pages, while a humane orientation has been preserved, so as to avoid treatment resembling that meted out to lepers in the past.

In tuberculosis work, the way has been long and dreary with few bright visions for the eye of the wayfarer, but more and more distinctly there is discernible on the horizon a country freed from a pitiless scourge.

(50)

Blacklock, J. - M.R.C. Report 172 - Tuberculous Disease in Children.