A

T H E S I S

ON

THE INCIDENCE AND EFFECT OF PULMONARY TUBERCULOSIS IN POST OFFICE WORKERS

- By -

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INTRODUCTION.

The present investigation has been undertaken with a view to discovering, if possible, what factors in the life of a Post Office employee and in the conditions of his occupation, influence the incidence and prognosis of Pulmonary Tuberculosis, and to what extent can regular and efficient service be expected from those who have contracted the disease.

The question is an important one for those employers who, like the Civil Service, give security of tenure, pay salaries during absence on sick leave and offer pensions on retirement whether on account of age or ill-health. Loss of time on the part of the employee means loss of revenue and substitutes have to be found to fill the vacant posts.

The present writer is not a specialist in tuberculosis, being engaged in a large out-patient practice on the staff of the Post Office, examining candidates and reporting upon the fitness or otherwise of special cases sent for the purpose.

The Post Office medical system offers unrivalled opportunity for an investigation of this kind for exact medical records are kept. No employee may absent himself on account of illness without the fact and the reason for such absence, being noted on his or her record.

New entrants are medically examined before being admitted to the Service. They have to serve a probationary period of not less than one year and, in some cases, seven years before finally being accepted. A history of pulmonary tuberculosis disqualifies a candidate unless the disease is the result of War Service, and then, only provided that the sputum has never been positive, that the candidate shows no signs of active disease and that he is considered capable of giving fifteen years regular and efficient service - a prognosis which, as will be seen later, is of doubtful value. It is therefore fair to say that on entry the new employee is in good health.

Free medical advice and treatment is provided for all grades of workers under a certain salary, and this means that the majority are able to avail themselves of medical attention, whenever they may desire to do so. Ample opportunity is thus given for prompt diagnosis.

When circumstances demand it, employees whose sick records are not wholly satisfactory, are periodically examined in order to discover, if possible, any underlying cause. It is a fact of clinical importance that frequent short, and apparently trivial sick absences often precede the discovery of lung lesions. Supervision of sick absence in this way makes it more difficult for cases of pulmonary tuberculosis to pass unnoticed.

Many of the staff subscribe to The Post Office Sanatorium Society and in the event of their contracting the disease, sanatorium treatment is available without loss of time. This is an asset, for prompt treatment may mean more rapid healing. Sick absence is allowed for so long as there is a reasonable prospect of return to duty with ability to give efficient service.

Security of tenure in Post Office employment, the fact that a patient knows that his job is waiting for him, relieves him of worry. He is in a better frame of mind and more likely to make progress than one who has no such security and to whom loss of employment means, perhaps, financial ruin for himself and family.

On return to duty, owing to the varied nature of Post Office work and hours of attendance, the patient can as a rule be provided with work within his capacity, and hours that will allow of regular rest and meal-times, for as long as the medical officer considers necessary.

It will thus be appreciated that the statistics which will be quoted later are obtained under the best possible conditions, and will show what is to be expected of those who have contracted pulmonary tuberculosis and have returned to work, "recovered."

It is emphasised that except for the figures used to illustrate the heredity factor, in no case are these statistics

based on statements from the patients themselves. Experience in similar forms of research has shown the writer that such statements as to work and progress are often misleading and should be accepted with caution.

Macnalty[1] has pointed out that no accurate figures as regards incidence of pulmonary tuberculosis are available and that such incidence in almost all cases has had to be measured by the death-rate. Post Office figures, however, represent exact records of incidence.

For financial reasons principally, workers in other undertakings may be compelled to return to work before they are actually fit for it. There are few industrial concerns where allowances can be made for those in poor health, but in the Post Office resumption of duty is not permitted until the worker is certified as fit.

The duties performed by Post Office employees are comparable to those in civil life. Broadly speaking, there are four main classes - outdoor and indoor, manual and clerical, and these duties are covered by postmen, porters, clerks, telegraphists, telephonists, engineers and supervising officers.

Comprehensive returns of over 5,000 cases of pulmonary tuberculosis have been collected and these make it possible to examine the subject from several angles. A brief description of the tables which will be found in the Appendix

Section, and in the text, will make it clear the lines on which the present investigation has been carried out.

TABLE I. New cases of Pulmonary Tuberculosis from 1914 to 1931, showing proportion per 1,000 staff employed compared with that for the civil population of England and Wales, and giving the incidence for male and female workers, London and the Provinces and the particular Post Office grades, separately. (Appendix)

TABLE II. Age-groups in 1,000 new cases, 1914-1930, who were still in the service at the end of 1931. (Appendix)

TABLE III. Same groups compared with the mortality per 100,000 living at each age in England and Wales in 1929, to show respective peaks only. (Appendix)

TABLE IV. New cases of Pulmonary Tuberculosis from 1914 to 1932 giving numbers of those who left the service during each year on account of this disease and for other causes, together with the number still serving. (Appendix)

TABLE V. Number of new cases who returned to work after onset in the years 1914 to 1927 inclusive, and the numbers still in the service after three, five and nine years. (Text)

TABLE VI. New cases in 1921, 1922 and 1923 who recovered, showing in detail their subsequent fate up to the end of the ninth year. (Text)

TABLE VII. New cases occurring in 1921 and 1922 in which

the history can be traced to the end of 1931, giving statistics regarding the number of deaths and survival rates. (Text)

TABLE VIII. Same cases showing duration of life. (Text)

TABLE IX. Total relapses of the 1914 to 1923 cases up to 1933. (Appendix)

TABLE X. Number of cases which relapsed during ten years from the date of onset of tuberculosis in 1914 to 1923. (Appendix)

TABLE XI. Same cases showing years during which the first relapse took place. (Text)

INCIDENCE.

Although it cannot be said that the Post Office incidence of pulmonary tuberculosis is higher than can be accounted for by ordinary causes, the fact that such a service accepts only the medically fit would perhaps lead one to expect better results than are actually the case. On turning to Table I we find that the incidence appears to exceed that of the civil population of England and Wales,(2) but it should be remembered that the Post Office figures are those for men and women between the ages of eighteen and sixty, the period which covers the greatest incidence of tuberculosis in this country. Further, the figures given by the Registrar General are those of the entire population from infancy to the years beyond sixty. The figures therefore are not strictly comparable.

From Table I (Appendix) it will be seen that the proportion of cases since the Great War has declined fairly steadily and this tends to confirm Macnalty's statement that it is justifiable to assume that because the death-rate is falling, the incidence of the disease is declining.

During the period under review - 1914 to 1930, it will be noted that of the Post Office grades the higher classes and all the women employees suffered to a less extent than those of the civil population. The highest proportion occurred among the

London postmen, porters and engineers. Next in order come these same grades in the Provinces. London workers in all classes combined, show a higher proportion of tuberculosis than those of the Provinces but it will be observed that telegraphists, sorting (or counter) clerks and women telephonists in London have less incidence than the same Provincial grades. There is a higher incidence among male than among women workers.

Cases of unestablished officers are shown separately. For technical or other reasons they are not employed on the permanent staff and their inclusion in these returns might confuse the issue.

In order to consider the question as why a body of presumably fit men in Post Office service contract tuberculosis to a seemingly greater extent than those in civil life we shall have to examine in detail their conditions of employment.

Social Status. The first thing that strikes one about Table I is the much higher incidence among the lower as compared with the higher grades. In London this is particularly noticeable, the average proportion being 2.50 per 1,000 employed as against 1.58 in the highest grades over the years 1914 to 1930. As we ascend the wage scale this proportion decreases; at the bottom of the scale we have postmen, porters and skilled workmen on the engineering staff, then follow sorters, sorting and counter clerks and telegraphists and lastly, the higher grade supervisory staff.

In the production of malnutrition, the lower wages probably operate under modern conditions in two ways. The worker has either to find housing accommodation in the overcrowded and poorer districts or he is compelled to migrate to a dormitory town where rent, rates and taxes together with the cost of travel to and from his work absorb a considerable proportion of his weekly wage.

Investigations into the question of overcrowding have been made from time to time by various independent authorities, and there would appear to be no doubt whatsoever but that there is a close connection between housing accommodation and the incidence of pulmonary tuberculosis.

Age. The age-groups are shown in a series of a thousand consecutive cases taken from the years 1914 to 1930 - cases who were still in the service in 1931. This series gives the peak years for men, those between the ages of 26 to 45, and for women, the years 18 to 35. The top of the peak for men lies between the ages of 31 and 35, that for women, between 21 and 25. (Table II).

Compared with the English mortality curve of 1929 (quoted by Macnalty,(1)) it will be noticed that the peak years for women correspond almost exactly. This would appear to support the view - if it be admitted that occupation has a definite effect on the incidence of tuberculosis - that so far as women

employees are concerned, there is nothing peculiar to Post Office conditions that is detrimental.

The curve for male workers, however, differs materially from that of the mortality curve of the civil population. Table III makes this difference clear and it will be seen that the peak of the Post Office age-curve lies between 25 to 35 years, whilst the mortality curve is at its highest between the ages of 45 and 55, a difference of ten years. Even if we allow five years for the gap that might reasonably be expected between a mortality curve and one based on onset, there is still a large deficit to be accounted for. The comparatively heavy responsibilities of men between the ages of 30 and 35 - the upkeep of the home and the feeding and clothing of a wife and family - would be common to both workers in Post Office service and in civil life and it is clear that some other factor must be operating.

Recruitment. It is also clear that recruitment cannot be at fault, for, as we have seen, Post Office employees are medically examined before appointment. The source from which candidates are drawn appears to be above suspicion. Fifty per cent of postmen are recruited from the boy messenger staff who join at the age of fourteen, when there are sufficient numbers available. The remaining fifty per cent come from outside the service, but in recent years a much larger percentage

has had to be recruited from this source, owing to the lack of boy messenger candidates. All porters and the majority of the engineering staff are taken from outside.

Postmen and porters recruited from this source are all ex-members of the army, navy and air force, that is to say, men roughly between the ages of 26 and 45 - the peak of the age-group curve. These men have spent the best years of their lives in healthy surroundings, leading open air lives and kept physically fit by regular exercise and regular meals. No one will deny that a radical change in their mode of living must take place when regular routine of this kind is exchanged for duties which have to be performed on early, late and night attendances, and where home conditions and personal hygiene are not subject to the same control as in barracks or aboard ship. Many of these homes leave much to be desired. The risk of exposure to infection must also increase, especially in towns and cities where people congregate together. There is, without doubt, considerable change in environment - a change which cannot be without some effect on health and which has probably some bearing on the incidence of Pulmonary Tuberculosis.

Skilled workmen on the engineering side are recruited from several sources - from the boy messenger staff, from the Labour Exchanges who supply men with some experience of fitting,

jointing or similar work outside - but principally from youths who come into the service at the age of sixteen. After a prolonged probationary period and provided they are in good health, established appointment may be offered, roughly, about the age of twenty-five. The few candidates who may be selected from outside the service may or may not have served in the fighting forces.

Taking this class as a whole, there is little alteration in their home conditions or environment when they join the Post Office staff. The same may be said of Sorters, Telegraphists and Sorting or Counter Clerks. A few of the latter class are taken from outside the service at the age of sixteen: all the others are recruited from the boy messenger staff except for the few vacancies in the Sorter Grades filled by postmen who have been successful in the educational examination.

Women are recruited mainly between the ages of sixteen to eighteen. Their duties are very similar to those in civil life, their age-groups correspond closely, and I think it will be agreed that whatever factor may have led to the change in the mortality curve during past years is common to both Post Office and civil women employees.

Fatigue. Fishberg[3] points out that excessive muscular exercise favours the progress of lung lesions and as fatigue is an important factor also, let us consider the work that postmen,

porters and skilled workmen are called upon to perform.

Postmen and porters are required to handle mailbags and the former to make collections and deliveries of letters and parcels. Mailbags are not supposed to exceed 60 lbs. and assistance can be had to handle this weight. If a mailbag exceeds 30 to 35 lbs. in weight, a postman is not required to carry it without assistance unless the distance is under a quarter of a mile. He does not spend his working day in collecting and delivering, he has to perform a certain amount of sorting, indoors.

Skilled workmen have to handle cables, raise manhole-covers, climb poles and roofs, but their duties are no heavier than those of workmen employed in similar trades.

None of these duties are as heavy as those of blacksmith striker, platelayer, navvy or carman, all of whom, between the ages of 20 and 60, have a death-rate which is not above, and at some ages is lower than the expected death-rate from pulmonary tuberculosis.(4) It cannot, therefore, be said that Post Office work comes within the category of "excessive muscular exertion", and there is nothing to show that the actual nature of the work has any bearing on the incidence of tuberculosis.

Dust. The fact that postmen and porters have to deal with letters, postal packets, parcels and mailbags raises the

question as to what part dust plays in the onset of the disease.

Many years ago, at certain times during the day, the larger sorting offices had to be closed to allow cleaners to sweep the floors and open the windows so that the smoke and smell of burning sealing-wax could escape. Nowadays, the modern sorting office is well ventilated and free from noticeable dust. Lead seals have taken the place of wax.

A recent analysis was made of dust collected from one of the Bag-rooms where mailbags are sorted after use, and where one would expect to find more dust than elsewhere in Post Office premises. The result was that the dust particles showed a very low count and compared well with counts done on outside air in the City of London. There were no micro-organisms visible without staining and the report of the analyst ended by saying: "The character of the dust particles is such that in my opinion, injury to health on the score of dust in the room is extremely unlikely." (5) Kettle has pointed out that there is no association between the inhalation of inert, neutral dusts and pulmonary tuberculosis.

But it will be noted that postmen, porters and skilled workmen are employed for the most part on outdoor duties. The remaining grades are indoor workers with a smaller incidence of tuberculosis. That being so I think that the question of dust as a factor in the production of the disease may be dismissed.

Influenza. A factor that may have an important bearing on incidence, is the prevalence of diseases of the influenzal type. In large offices all over the country, the common cold and influenza,both of which are highly infectious,spread rapidly where many workers are gathered together at the same time. Catarrhal conditions not only lower the powers of resistance but, it is said, may bring latent foci of tuberculosis into activity. If this be a fact, then, in cities and towns where large sorting offices exist and there are few workers who escape colds and influenza, the risk of infection is above that of civil life. Fishberg, however, discussing the effect of influenza, denies any connection unless in cases where the patient has had a tuberculous lesion before influenza supervened. The same authority states that "on the whole.....no etiological relationship between acute and subacute inflammatory processes of the nose and throat and pulmonary tuberculosis has been found to exist." Yet, my experience has been that most phthisical patients give a history of frequent colds.

Heredity. It has long been recognised that tuberculosis runs in certain families but there is considerable doubt as to whether any definite corroboration of transmission can be obtained from statistics. Family histories as given by the patient are notoriously vague and Fishberg states that they

are hardly of any value for that reason. The fact that a patient develops tuberculosis whilst living with a tuberculous parent or parents does not necessarily mean that his predisposition is the result of heredity.

Nevertheless, great importance is attached by some to the family history factor and although in the Post Office a candidate, otherwise healthy, who gave a family history of tuberculosis would not be turned down, some Life Insurance offices add years because of this history.

In a series of five thousand consecutive cases, 919 (18.3%) gave a history of family incidence and 70 (1.4%) reported wives or husbands suffering from the disease. There was familial contact in 879 (17.5%) cases including wives and husbands.

PROGNOSIS.

For the purposes of the present investigation the question of prognosis is to be considered from the point of view of the patient's subsequent ability to render regular and efficient service.

The initial attack of pulmonary tuberculosis necessitates a prolonged period of sick absence varying from six to nine months. The average worked out in the year 1930, amounted to just under twenty-seven weeks for those who "recovered" and considerably above this figure for those who eventually had to be retired whilst on sick leave, the sick absence figures being thirty-four weeks in these cases. To this heavy sick rate must be added further loss of time when,as will be seen later, a large percentage of these recovered cases relapse once, or more than once. Sick absence on account of a relapse varies from three to six months or more.

Table IV (Appendix) gives a series of cases which occurred from 1914 to 1932 (inclusive). This table shows that 5,075 new cases were reported in these years and gives their fate in subsequent years. It should perhaps be explained that the columns "still in the service" under each year may contain patients on sick leave who eventually left without resuming duty.

It will be noted that 2,579 cases out of the total 5,075 never returned to work after onset - a loss in man-power of 50.8%. Details are given of each year: those for example in 1914 show that of the 321 new cases, twenty-five remained in the service in 1932 whilst 165 or 51.4% were unable to return to work after the initial absence. This number, however, includes probationers whose appointments would be automatically cancelled,but even so, their numbers being small, the percentage is not materially affected.

Analysis of the numbers of new cases in the years 1914 to 1927 who were still in the service at certain periods from the date of onset, gives us an indication of the expectation of years of service. Table V shows the position at the end of three, five and nine years from the date of onset, of those who returned to work after the first absence.

TABLE V.

Year	Resumed duty	End of 3rd Yr.	Percent.	End of 5th Yr.	Percent.	End of 9th Yr.	Percent.
1914	156	79	50.6	59	37.8	44	28.2
1915	128	74	57.8	57	44.5	39	30.4
1916	154	88	57.1	77	50.0	59	38.3
1917	143	82	57.3	71	49.6	56	39.1
1918	180	118	65.5	105	58.3	88	48.8
1919	166	112	67.4	91	54.8	73	43.9
1920	147	99	68.0	88	59.8	82	55.7
1921	127	79	62.2	71	55.9	58	45.6
1922	104	65	62.5	53	50.9	40	38.4
1923	145	98	67.6	88	60.6	53	36.5
1924	142	105	73.9	89	62.6	-	-
1925	150	110	73.3	83	55.3	-	-
1926	108	84	77.7	56	51.8	-	-
1927	111	68	61.2	56	50.4	-	-

Briefly, this shows that after three years 64·4% remained
" five " 53% "
" nine " 40·4% "

It will thus be seen that less than half, viz. a quarter of the total number of new cases, were still serving at the end of the ninth year. All the retirements were not, of course, due to pulmonary tuberculosis,but the largest proportion was on that account. Table VI gives a more detailed account of the subsequent history of the cases which occurred in the years 1921, 1922 and 1923 taken up to the end of the ninth year. The total number of cases where resumption took place as will be seen by referring to Table IV, was 376.

TABLE VI.

	Retirements on account of			
	Pulmonary Tuberculosis	Illhealth not P.T.	Age	Transfer Resignation, Dismissal
Same year	4	1	-	3
1st "	35	4	1	4
2nd "	38	5	1	12
3rd "	20	3	1	2
4th "	14	1	1	1
5th "	11	-	-	2
6th "	12	-	-	-
7th "	13	4	-	8
8th "	4	4	1	2
9th "	6	3	1	3
Totals	157	25	6	37

The position at the end of the ninth year was as follows:-

Left (or died) as a result of Pulmonary Tuberculosis ... ... 157 (41·7%)
Left - other causes ... ... 68 (18·1%)
Still serving ... ... 151 (40·2%)

These details confirm the statement that most retirements are due to tuberculosis.

It is a matter of difficulty to discover the ultimate fate of those who have left the service, in order to get some idea of the death-rate, but it has been possible to trace 182 cases from the 1921 figures of those who were still in the service in that year. Table VII gives the results down to 1931 and it will be seen that 56·5% of deaths took place within five years. These figures, however, are not strictly accurate as it was not possible to trace eleven of the 1921 cases which totalled 193. A second series taken from the 1922 figures is complete and gives much the same result. 61·5% of deaths took place within five years and both of these figures are somewhat higher than Martin's percentage of fifty (6) but closely approximating the percentage given by him from the London County Council figures in 1930. (7)

TABLE VII.

Year	Total Cases	Died in Service	Died on Pension	Total Deaths	Per Cent.	Total Alive	Per Cent.
1921	182	62	51	113	62·1	69	37·9
1922	151	68	37	105	69·5	46	30·5

TABLE VIII.

Duration of life of those deceased.

Year	Total Deaths	Five years and under	Five years and over	Average duration of life.
1921	113	103	10	1 10/12 yrs.
1922	105	93	12	1 8/12 "

The survival rates of 37·9% and 30·5% compare favourably with the rate of 20·1% shown by the London County Council (8) over the same period i.e. 1921 to 1931, although admittedly the L.C.C. figures are somewhat misleading.

Statistics regarding relapses which may lead to premature retirement and which certainly result in further loss of time through sick absence, give additional information as regards prognosis. Table IX (Appendix) shows the total relapses for each year from 1914 to 1923 up to the end of 1933. Although the figures for each year are not comparable - the period of observation diminishes as the years pass - they give an average relapse percentage which varies from 38·8 to 59 per year. Whether or not any or all of these return to duty, a certain amount of sick leave is necessarily incurred.

Table X (Appendix) gives a series of 592 cases who were still in the service at the end of ten years from the date of onset of pulmonary tuberculosis (1914 to 1923). The average percentage of relapses for each year during a period of ten years following onset was 23·6, but it will be noted that some of the cases relapsed more than once bringing the total percentage of relapses per year under review to 37·2%. The figures for each year, however, show wide variations. Outdoor workers have the heavier incidence, women workers show fewer relapses than men, and the majority of relapses were incurred by those in the lower grades of the service.

(1)

The Ministry of Health has laid down the criterion, that a case of pulmonary tuberculosis should not be regarded as recovered until five years have elapsed without any signs or symptoms of active disease, but Table XI shows that out of a total of 592 resumptions, i.e. "recoveries", 136 relapsed and of these thirty-two continued at work for the full five years before relapsing for the first time. The years in which these cases relapsed following recovery are also indicated.

TABLE XI.

No.of cases	No.who Relapsed	Before 6th Yr.	After the sixth year - 32				
			6th Yr.	7th Yr.	8th Yr.	9th Yr.	10th Yr.
592	136	104	10	8	5	6	3

Thus of the total number of cases which relapsed - only the first relapse being considered - 23·5% remained in good health for more than five years after the initial attack.

SUMMARY.

Incidence.

(1) The Post Office statistics used in the present investigation are exact, as complete records of sick absence are kept and pulmonary tuberculosis is locally notifiable to the Chief Medical Officer.

(2) Candidates for appointment to the Post Office staff are medically examined and are therefore in good health on acceptance. A history of pulmonary tuberculosis, except in "War Disabled" candidates, is a bar to appointment.

(3) As the conditions of service are conducive to peace of mind and early treatment is always available, patients have the best possible opportunities for recovery. This means that the statistics quoted have been obtained under ideal conditions.

(4) The duties of Post Office employees are comparable to those of civil life.

(5) The number of cases of pulmonary tuberculosis is higher than that which obtains in civil population, the higher proportions being confined to the lower grades of workers, but these proportions are not strictly comparable because the Post Office figures refer only to cases between the ages of eighteen and sixty.

(6) Lower grades show considerably higher incidence than

that of the women employees and higher grade officers.

(7) Incidence among outdoor workers is higher than that of the indoor.

(8) London shows a higher incidence than the Provinces.

(9) The age incidence in women compared with the mortality rates amongst the civil population is the same. Male workers on the other hand give an age incidence some ten years lower than that of the civil population.

(10) The decline in the incidence of tuberculosis is confirmed by the Post Office statistics.

(11) Social status plays an important part in the incidence among Post Office employees.

(12) The recruitment from certain classes may have some bearing on the question of incidence.

(13) Influenza and catarrhal colds are prevalent in the larger Post Office premises and may have the effect of lighting up latent foci of the disease.

(14) Dust and fatigue so far as Post Office conditions of work are concerned, do not assume sufficient proportions to be considered as factors in the incidence of pulmonary tuberculosis.

(15) In a series of 5,000 cases 18·3% gave a family history of tuberculosis and 1·4% had wife or husband suffering from the disease. There was familial contact in 17·5% of cases.

Prognosis.

(1) Half of those contracting tuberculosis do not return to work after the initial onset.

(2) After three years, 64·4% of those who returned to work remain; after five years 53% and after the ninth year only 40·4%.

(3) Many cases relapse. Over a period covering eleven to twenty years 38·8% to 59% relapsed per year. Those who had given ten years' service and were still employed showed 23·6% of relapses.

(4) Relapses occur principally in the second and third years. First relapses, however, are found to the extent of 23·5% after five years of good health.

(5) Relapses are responsible for a high rate of premature retirements, amounting to 41·7% in a series of cases followed up to the end of the ninth year.

(6) Sick absence on account of tuberculosis is very heavy amounting to an average of twenty-seven weeks in the first instance and three to six months for each relapse.

(7) Death-rate returns show that 56·5 to 61·5% of cases die within the first five years of contracting the disease.

CONCLUSIONS.

As the incidence of pulmonary tuberculosis among women employees and those in the higher grades is less than the rate for the civil population, we need only consider the postmen, porter and engineer classes and the sorter, telegraphist, sorting and counter clerk grades, as these two groups comprise the outdoor and indoor workers of the lower paid staff.

The first deduction to be made from the facts regarding Post Office conditions is that there would appear to be nothing peculiar to the work, per se, that could influence the incidence of tuberculosis or affect its prognosis. The duties entail no excessive muscular exertion or long hours, and dust may be regarded as a negligible factor. Nor can it be said that Post Office work attracts persons of impaired physique, as many of the lighter occupations do - a factor which is blamed for high tuberculosis incidence in these occupations - because the greatest care is taken to see that the future employee is in sound health before he takes up duty.

If there were any detrimental factor in Post Office conditions, the younger men of twenty and below, whose incidence of disease is considerably less than any other group of Post Office workers, except those above the age of fifty-five,

ought to show some evidence of its operation. In the printing trade, for example, the largest age-groups affected are those of the younger and the older men.(9) The comparative immunity enjoyed by the young postal workers can partly be explained by the fact that there is nothing in postal duties as such that has any definite effect on their health. There is no sudden alteration in their mode of living when they come into Post Office service. They continue to live in the same milieu. On the other hand, as we have seen, the majority of men between the ages of twenty-six and forty-five are recruited from the fighting services and theirs is the age-group which shows the highest incidence of tuberculosis. We cannot ignore the suggestion that change of environment and mode of living may be a contributory factor. These men appear to marry at an earlier age than those brought up from youth in Post Office service. The younger men are keen on sport and are the mainstay of the many sports clubs open to Postal servants. Analysis of the membership of the Football and Cricket Clubs open to some 8,000 London workers at Headquarters showed that only 22% of the members were ex-army, navy or air force men.

If Post Office conditions of service, viz. security of tenure, sick pay and pensions banish anxiety for the future, regular employment of this kind perhaps makes it easier for the employee to commit himself financially, for example, by house purchase, by the purchase of furniture or other goods

payable on the instalment plan. By so doing, he depletes the weekly wage, and has not enough to pay for his needs or for the extras which a tuberculosis patient requires, should he develop the disease. In both these cases, malnutrition results, a condition which,most authorities agree,lowers the general powers of resistance to disease-producing causes. Malnutrition may also result from overcrowding in the poorer districts. This is probably true of London, where the incidence of pulmonary tuberculosis is higher than that in the Provinces. Loss of wages due to expenses in connection with housing accommodation in the healthier but more distant districts and bad management of the household budget are possible contributory causes.

It is easy to attach too much importance to low wages as a factor because employees earning the same wages show great differences in their home conditions, these varying from the appearances of extreme poverty to those of comparative affluence. Much, to my mind, depends on the housewife. On the other hand, to have to work eight hours per day on a low wage with heavy overhead expenses is much more likely to lead to a lowering of the general health and powers of resistance than to do no work at all on an even smaller weekly allowance. Unemployment has not led to an increase in tuberculosis which continues to fall.

Influenza and catarrhal colds are known to precipitate disease and these probably play some part in the incidence of tuberculosis. Post Office incidence of these infective conditions is high and they cannot be left out of account.

Outdoor workers are, as a body, more prone to tuberculosis than indoor employees but as the lowest grades are on outdoor duties, there is no evidence to show what share of the blame can be apportioned to exposure. According to Burrell,(10) those who work in the open air are on the whole more healthy than those who have indoor employment. The statement that outdoor jobs mean manual labour and, according to the same authority, only a few consumptives can stand this, would hardly apply to the Post Office employee, for the patient would not be allowed to resume such work if he were regarded as otherwise than "recovered."

The grade next in order of frequency, the sorters, telegraphists, sorting and counter clerks, are entirely employed on indoor duties, yet their incidence of tuberculosis is lower than that of the outdoor grades. These employees are paid at a higher rate than the latter.

It is, therefore, difficult, considering all the evidence at our disposal, to get away from the fact that Scheel(11) is correct when he states that the standard of living is the important factor as regards incidence.

There is no reason for regarding Post Office statistics on heredity as more reliable than those of other authorities based on statements made by patients, nor are they sufficiently striking to be quoted as a reason for rejecting candidates, otherwise healthy, who give a family history of tuberculosis. Furthermore, as we have no means of comparing these figures with statistics founded on the family histories of those who never develop the disease, their significance cannot be correctly gauged.

We have noted that of those who contract the disease, half their number never again come back to duty and of the remainder, the relapse incidence is high. We have seen that as the years pass the number of cases still in the Service becomes less and less. In three to five years just over fifty per cent have gone and by the tenth year sixty per cent have left the service. The initial absence of those who returned to work, added to the necessarily longer periods of absence incurred by those who were invalided without resuming duty, and increased by the sick absences for relapsed cases, all combine to make a heavy sick rate. This loss has to be allowed for by keeping a reserve force to fill the vacant duties. Sick absence is therefore no small item on the debit side of the balance sheet in undertakings similar to the Post Office. Pensions and gratuities have also to be paid in the

event of retirement.

If after the initial sick absence the patient could return to duty certified as cured, no objections could be raised to the employment of candidates giving a history of tuberculosis and showing no signs of active disease at the time of entry, but it is impossible, in my opinion, to assess future ability either by clinical means or by observation over a period of years e.g. by extended probation. At no time in his life can it be said definitely of any one who has suffered from active pulmonary tuberculosis, that a recurrence of active mischief will not take place. I would go further and say that with a return to his former occupation the patient's chances of future trouble are more likely than that his health will remain good. All the evidence available from Post Office statistics is in support of this view, which applies particularly to manual workers and to those whose social conditions do not permit of appropriate after-care, especially during the three years following onset.

No man who has to work for his living can ever be regarded as recovered because there are so many factors which, given the opportunity, will once again light up the disease. To guard against a recurrence, demands from the patient a life of care, and a singleness of purpose towards his health which is, in my opinion, beyond the powers of the majority of those

who have to compete for a living in the open industrial market - a course which, as the Joint Tuberculosis Committee justly observes, they can never pursue with safety. (12)

From the employers' point of view, the results of the present investigation go to show that the appointment to the staff of those who give a history of pulmonary tuberculosis, is uneconomical in any undertaking which offers security of tenure, sick pay and pensions.

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APPENDIX.

TABLE I.

PULMONARY TUBERCULOSIS. ESTABLISHED STAFF. SHEWING PROPORTION PER 1,000 STAFF EMPLOYED.

YEAR	No. of cases	Proportion to Total Staff	Civil Population E. & Wales proportion	All Classes				All Classes				Telst. S.C. & Ts. Sorters.				Postmen, Porters & Skilled Workmen				Telephonists Female				Other Grades				Cases Unest. Offrs.	Total cases. Estab. and Unest. Offrs.	
				London		Prov.		Male		Female		London		Prov.		London		Prov.		London		Prov.		London		Prov.				
				Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion	Cases	proportion			
1914	233	1·96	2·20	95	2·45	138	1·16	191	2·01	42	1·79	20	1·69	37	1·72	27	2·90	65	1·76	3	1·08	17	2·91	45	3·02	19	1·22	88	321	S.W.Porters included in other grades 1914-1919
1915	212	2.15	2·07	63	1·90	149	2·28	178	2·39	34	1·42	15	1·68	37	2·15	20	3·09	81	3·00	8	2·49	11	1·94	20	1·37	20	1·30	75	287	
1916	261	2·96	2·10	105	3·29	156	2·78	210	3·45	51	1·87	29	3·57	38	2·76	34	5·07	69	3·32	6	1·35	16	2·10	36	2·84	33	2·35	78	339	
1917	228	2·96	2·18	93	3·23	135	2·81	187	3·74	41	1·52	30		39		28		68		8		8		27		20		74	302	)Detailed x
1918	260	3·29	2·17	90	3·11	170	3·35	209	3·95	51	1·95	24		49		27		79		9		17		30		25		66	326	)figures
1919	234	2·18	1·81	77	1·97	157	2·30	192	2·41	42	1·52	18	1·94	54	3·13	29	3·31	64	2·28	2	·41	14	1·92	28	1·73	25	1·61	64	298	) Not x)available
1920	226	1·74	1·65	76	1·64	150	1·80	187	1·88	39	1·28	22	2·00	45	2·02	31	2·13	80	1·92	9	1·57	7	·89	14	·92	18	1·52	56	282	
1921	267	1·96	1·57	94	2·00	173	1·93	203	1·93	64	2·05	22	1·98	51	2·16	36	2·41	87	1·93	12	2·20	16	1·93	24	1·56	19	1·53	28	295	
1922	202	1·51	1·47	74	1·53	128	1·50	181	1·74	21	·71	14		26		30		80		5		7		25		15		42	244	See above x
1923	241	1·79	1·49	83	1·68	158	1·86	194	1·85	47	1·58	21	1·72	37	1·73	35	2·23	91	2·03	7	1·26	16	2·19	20	1·26	14	1·21	43	284	
1924	226	1·80	1·47	90	1·87	136	1·76	180	1·91	46	1·49	20	1·69	39	1·91	34	2·33	74	1·95	5	·78	11	1·47	31	2·03	12	1·06	50	276	
1925	229	1·65	1·51	81	1·57	148	1·70	185	1·73	44	1·38	15	1·20	34	1·59	39	2·33	83	1·81	9	1·36	14	1·77	18	1·15	17	1·41	60	289	
1926	165	1·16	1·45	57	1·06	108	1·21	129	1·17	36	1·09	8	·62	27	1·24	22	1·26	62	1·33	11	1·56	12	1·45	16	·97	7	·57	47	212	
1927	215	1·48	1·38	94	1·71	121	1·35	168	1·51	47	1·38	20	1·58	30	1·37	33	1·85	68	1·45	15	1·98	9	1·04	26	1·54	14	1·11	44	259	
1928	221	1·49	1·35	88	1·56	133	1·45	166	1·47	55	1·57	19	1·54	34	1·54	36	1·94	72	1·51	20	2·47	13	1·45	13	·75	14	1·09	46	267	
1929	211	1·40	1·33	104	1·80	107	1·15	157	1·36	54	1·50	21	1·72	16	·72	38	1·96	64	1·30	18	2·06	10	1·09	27	1·55	17	1·33	49	260	
1930	238	1·57	1·26	109	1·87	129	1·38	191	1·65	47	1·31	21	1·75	24	1·10	44	2·19	83	1·67	19	2·20	12	1·32	25	1·43	10	·78	50	288	
Average 14-30		1·94	1·67		2·01		1·86		2·12		1·49		1·76		1·79		2·50		1·94		1·62		1·67		1·58		1·29			
1931	197	1·28	1·23[x]	82	1·40	115	1·21	165	1·40	32	·89	18	1·51	24	1·10	39	1·89	69	1·35	8	·98	8	·87	17	·95	14	1·08	49	246	

x Not given by Registrar General after 1930
but worked out from No. of cases and estimated population in Registrar General Statistical Review.

TABLE II.

Age-Groups in 1,000 new cases 1914 - 1930 who were still in the Service at the end of 1931.

Ages	18-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
Males	34	106	147	189	163	132	70	41	4
Females	13	39	26	20	6	4	6	0	0

TABLE III.

Age-groups of Post Office employees from Table II compared with the Mortality per 100,000 living at each age in England & Wales in 1929, to show respective peaks only.

MALES.

Age Groups	18-20	20-25	25-35	35-45	45-55	55-60
Mortality	63 (15-20)	107	119	149	173	136 (55-65)
Post Office incidence	34	106	336	295	111	4

FEMALES.

Age Groups	18-20	20-25	25-35	35-45	45-55	55-60
Mortality	100 (15-20)	134	109	77	60	48 (55-65)
Post Office incidence	13	39	46	10	6	0

TABLE IV.

NEW CASES OF PULMONARY TUBERCULOSIS 1914-1932.

YEAR	New Cases	Left without resuming	Resumed Duty	1914			1915			1916			1917			1918			1919			1920			1921			1922			1923			1924			1925			1926			
				Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.
1914	321	165	156	108	2	211	190	10	121	214	14	93	223	19	79	229	25	67	235	27	59	238	28	55	239	31	51	240	33	48	242	35	44	245	35	41	246	38	37	246	38	37	248
1915	287	159	128	-	-	-	104	6	177	166	10	111	181	15	91	191	22	74	200	24	63	205	25	57	208	27	52	209	30	48	210	37	40	211	37	39	212	38	37	213	40	34	214
1916	339	185	154	-	-	-	-	-	-	118	3	218	210	9	120	227	11	101	235	16	88	242	17	80	245	17	77	247	21	71	247	29	63	250	29	60	250	30	59	251	30	58	252
1917	302	159	143	-	-	-	-	-	-	-	-	-	109	6	187	177	18	107	193	22	87	198	22	82	203	23	76	206	25	71	209	32	61	210	34	58	210	35	57	211	35	56	211
1918	326	146	180	-	-	-	-	-	-	-	-	-	-	-	-	93	5	228	162	11	153	183	13	130	193	15	118	200	17	109	201	20	105	206	21	99	208	24	94	210	25	91	211
1919	298	132	166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	71	4	223	149	10	139	162	13	123	168	18	112	174	23	101	179	28	91	181	34	83	183	35	80	184
1920	282	135	147	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68	3	211	143	10	129	156	12	114	163	20	99	169	21	92	171	23	88	172	23	87	174
1921	295	168	127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	4	193	176	10	109	185	21	89	191	25	79	193	27	75	195	29	71	196
1922	244	140	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	86	7	151	143	12	89	157	17	70	160	19	65	167	20	57	171
1923	284	139	145	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88	2	194	145	4	135	166	9	109	177	9	98	182
1924	276	134	142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	1	198	136	5	135	159	6	111	165
1925	289	139	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63	1	225	132	10	147	150
1926	212	104	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58	4	150	99
1927	259	148	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	86
1928	267	139	128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1929	260	135	125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1930	288	150	138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1931	246	102	144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1932	248			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NEW CASES OF PULMONARY TUBERCULOSIS 1914-1932.

1918			1919			1920			1921			1922			1923			1924			1925			1926			1927			1928			1929			1930			1931			1932		
Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service	Left P.T.	Left other causes	Still in service
229	25	67	235	27	59	238	28	55	239	31	51	240	33	48	242	35	44	245	35	41	246	38	37	246	38	37	248	38	35	249	38	34	249	40	32	250	43	28	252	44	25	252	44	25
191	22	74	200	24	63	205	25	57	208	27	52	209	30	48	210	37	40	211	37	39	212	38	37	213	40	34	214	40	33	214	40	33	214	40	33	215	42	30	216	43	28	217	43	27
227	11	101	235	16	88	242	17	80	245	17	77	247	21	71	247	29	63	250	29	60	250	30	59	251	30	58	252	30	57	256	30	53	257	30	52	257	36	46	257	38	44	257	38	44
177	18	107	193	22	87	198	22	82	203	23	76	206	25	71	209	32	61	210	34	58	210	35	57	211	35	56	211	36	55	211	36	55	212	37	53	214	45	43	214	49	39	214	49	39
93	5	228	162	11	153	183	13	130	193	15	118	200	17	109	201	20	105	206	21	99	208	24	94	210	25	91	211	27	88	211	27	88	212	27	87	213	42	71	214	45	67	216	47	63
-	-	-	71	4	223	149	10	139	162	13	123	168	18	112	174	23	101	179	28	91	181	34	83	183	35	80	184	36	78	189	36	73	191	36	71	194	43	61	195	46	57	197	47	54
-	-	-	-	-	-	68	3	211	143	10	129	156	12	114	163	20	99	169	21	92	171	23	88	172	23	87	174	23	85	176	23	83	176	24	82	176	32	74	180	32	70	180	33	69
-	-	-	-	-	-	-	-	-	98	4	193	176	10	109	185	21	89	191	25	79	193	27	75	195	29	71	196	29	70	201	29	65	202	29	64	204	33	58	205	35	55	206	36	53
-	-	-	-	-	-	-	-	-	-	-	-	86	7	151	143	12	89	157	17	70	160	19	65	167	20	57	171	20	53	174	20	50	178	20	46	178	24	42	179	25	40	179	28	37
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88	2	194	145	4	135	166	9	109	177	9	98	182	9	93	187	9	88	195	9	80	199	21	64	202	24	58	205	26	53
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	1	198	136	5	135	159	6	111	165	6	105	173	6	97	180	7	89	189	25	62	193	25	58	193	26	57
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63	1	225	132	10	147	150	10	129	169	10	110	173	12	104	181	25	83	188	26	75	191	28	70
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58	4	150	99	8	105	114	8	90	119	9	84	128	22	62	132	24	56	135	25	52
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	86	0	173	156	3	100	170	3	86	182	9	68	189	9	61	191	12	56
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68	3	196	148	5	114	166	17	84	175	20	72	178	22	67
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88	4	168	145	7	108	162	8	90	170	10	80
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92	4	192	164	8	116	188	12	88
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61	0	185	109	3	134
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89	1	158

TABLE IX.

TOTAL RELAPSES 1914-1923 taken to end of 1933.

(Number of new cases who returned to duty after onset shown in brackets under their respective years.)

Year	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923
Number	(156) 92	(128) 71	(154) 68	(143) 70	(180) 81	(166) 81	(147) 57	(127) 50	(104) 55	(145) 77
Percentage	59	55·5	44·1	48·9	43·9	48·8	38·8	39·4	52·9	53·1

TABLE X.

RELAPSES 1914 to 1923.

All new cases who "recovered", resumed duty, and relapsed within ten years shewing period before relapse and incidence among Outdoor and Indoor Workers, Male and Female.

Year	Cases still serving after 10 years				Out-door	In-door	Male	Female	Period within which relapses occurred									
	Total No.	Total No. Relapses	No. who relapsed	No. who relapsed more than once					1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th yr.
1914	44	18(40·9%)	12(27·2%)	5	6	6	12	0	1	2	1	2	2	0	3	3	2	2
1915	39	13(33·3%)	10(25·6%)	2	6	4	10	0	0	2	3	4	3	0	0	1	0	0
1916	59	24(40·6%)	15(25·4%)	5	11	4	15	0	1	5	5	3	4	1	0	2	1	2
1917	56	26(46·4%)	14(25·0%)	6	12	1	14	0	1	8	6	4	1	4	0	0	0	2
1918	88	33(27·5%)	18(20·4%)	9	11	7	17	1	1	8	7	2	4	3	1	3	2	2
1919	73	28(38·3%)	19(26·0%)	6	13	6	19	0	2	10	3	2	3	1	3	0	2	2
1920	82	19(23·1%)	13(15·8%)	4	4	9	11	2	1	3	1	2	4	1	4	1	1	1
1921	58	15(26·0%)	10(17·2%)	5	4	6	8	2	0	0	5	2	2	5	1	0	0	0
1922	40	14(35·0%)	10(28·0%)	2	5	5	9	1	1	5	3	1	0	2	0	0	1	1
1923	53	27(50·9%)	15(28·2%)	7	6	9	12	3	0	4	6	1	3	5	1	4	3	0