

Form used in making reports upon which this analysis is based :

(Form 1 (Path.))

TUBERCULOSIS RESEARCH COMMITTEE.

POST-MORTEM RECORD OF A CASE OF TUBERCULOSIS

or of

A CASE SHOWING TUBERCULOUS LESIONS.

Name Tribe Age

Mine P.P. No. Mine No.

Underground Service { On Machines y. m. Tuberculin Test (if any) { Date Result

Surface Service y. m. Date of P.M.

Medical Officer.

GLANDS.	NORMAL.	ABNORMAL.				
		En-larged.	Pig-mented.	Fi-brosed.	Case-ous.	Calca-reous.
(a) Cervical						
(b) "Clavicular"						
(c) Hilus, Tracheo-bronchial and Mediastinal ...						
(d) Glands just above the diaphragm						
(e) Upper Retro-peritoneal ...						
(f) Lower Retro-peritoneal ...						
(g) Portal						
(h) Mesenteric						

LUNGS. (Types of Lesions to be Recorded.)	Lesion not Present.	Lesion Present.	
		Right.	Left.
(a) Excess of Pigmentation without Palpable Fibrosis			
(b) Small Black Simple Silicotic Nodules			
(c) Discrete Steel-grey Tuberculo-silicotic Nodules			
(d) Gross Areas of Tuberculo-silicotic Fibroid Consolidation			
(e) Gross Areas of Tuberculo-silicotic Fibroid Consolidation with Excavation			
(f) Miliary Tuberculosis			
(g) Caseating Tuberculosis, Broncho-pneumonic or Pneumonic... ..			
(h) Caseating Tuberculosis, Broncho-pneumonic or Pneumonic with Excavation			
(i) Chronic Fibroid Phthisis without Silicosis ...			
(j) Old Healed Fibroid or Calcareous Scars ...			
PLEURAE.			
(a) Old Adhesions			
(b) Effusion			
(c) Tuberculous Granulation Tissue			
(d) Gross Caseation			

	No Tuberculosis.	Tuberculosis Present.	
		Miliary.	Casating.
Pericardium			
Heart			
Spleen			
Liver			
Kidneys			
Suprarenals			
Peritoneum		Plastic.	With Effusion.
Small Intestine		Tubercles only.	Actual Ulceration
Meninges and Brain (delete if not examined) ...		Meningitis	Tubercu- loma.
Bones and Joints		<i>Give Details of Lesions :</i>	

Any other Disease or Diseases Present at Time of Death.....

Past Medical History { (a) Not known
 or, (b) No previous Admissions to Hospital.....
 or, (c) Causes of previous Ad-
 missions to Hospital, with
 dates. }

Cause of Death, as certified.....

Notes on any Special Features or Points of Interest :

When filling up this Record Form, if a + be put against any item in the "Normal," "Lesion not Present," or "No Tuberculosis" columns, then no entry need be made in the corresponding "Abnormal," "Lesion Present," or "Tuberculosis Present" columns.

Degrees of lesions should be indicated thus :—

Slight + ; Moderate ++ ; Extensive +++.

Completed Record Forms to be sent to "The Chairman, Tuberculosis Research Committee, South African Institute for Medical Research, P.O. Box 1038, Johannesburg." Any pathological material which the recorder thinks might be of interest, or concerning which he is in doubt, may also be sent.

This Record is quite independent of the Statutory Report and Lungs sent to the Miners' Phthisis Bureau, although it may deal with a Bureau case.

Additional copies of this Form may be obtained on application to the "Chairman, Tuberculosis Research Committee," at the above address.

APPENDIX NO. 8.

CLASSIFICATION OF CLINICAL TYPES OF TUBERCULOSIS IN NATIVE MINE WORKERS FROM THE X-RAY AND CASE RECORDS FILED AT THE MINERS' PHTHISIS MEDICAL BUREAU.

BY DR. L. G. IRVINE AND PROFESSOR LYLE CUMMINS.

1. In all, records of 512 cases of "simple tuberculosis" and 250 cases of tuberculosis with silicosis were examined, and the results entered on special cards devised for the purpose of this investigation (see p. 419).

2. A preliminary grouping of the cards of simple tuberculosis cases according to sputum findings and by years of service on the mines is set forth in Table I.

TABLE I.

SIMPLE TUBERCULOSIS.

Distribution of Cases by Years of Work on Mines.

Years.	Sputum-Positive.		Sputum-Negative.	
	Number.	Per Cent. of Total.	Number.	Per Cent. of Total.
1st year	66	17	36	30
2nd year	43	10	20	17
3rd year	54	14	18	15
4th year	75	20	10	8
5th year	50	12	11	9
Over 5 years	104	27	25	21
Total	392	100	120	100

From this table it will be seen that, of the 512 cases, 392 were sputum-positive and 120 sputum-negative. It will be noticed, too, that, while the numbers for each year up to the fifth, inclusive, are fairly constant in the sputum-positive group, the numbers fall with each year of service in the sputum-negative group; suggesting that the lung lesions tend to be more "open" in the mine boys who have worked longest on the Rand.

3. The next grouping was based on the *extent of disease* as evaluated by an examination of the X-ray films; the results being entered under three headings: A, minimal; B, moderate, and C, maximal extent.

TABLE II.

SIMPLE TUBERCULOSIS.

Distribution of Cases according to Extent of Lesions as seen by X-ray.

A=Minimal. B=Moderate. C=Maximal.

Years.	Sputum-Positive.			Sputum-Negative.		
	A. No. %	B. No. %	C. No. %	A. No. %	B. No. %	C. No. %
1st year	13 20	26 39	27 41	13 36	19 53	4 11
2nd year	8 18	17 40	18 42	1 5	12 60	7 35
3rd year	11 20	24 45	19 36	— —	11 61	7 39
4th year	6 8	36 48	33 44	1 10	6 60	3 30
5th year	6 12	20 40	24 48	1 9	7 65	3 26
Over 5 years	22 21	37 36	45 43	3 12	13 52	9 36
Totals	66 17	160 41	166 42	19 16	68 57	33 27
Grand Total		392			120	

As will be seen from Table II, there was a higher percentage of cases in the C group amongst the sputum-positive cases than amongst the sputum-negative; the difference being most marked in the "first-year" cases.

4. As will be seen on referring to the specimen card (p. 000), a further attempt was made to divide up the cases (1) according to the degree of systemic disturbance, as assessed by loss of weight and by the description of the patient's state, and (2) according to the degree of pyrexia. The systemic disturbance was entered on the cards under the four headings, "Nil," "S1," or slight, "S2," or moderate, and "S3," or severe. The temperature, too, was entered under one of four headings, Normal, T+, T++ and T+++ , which explain themselves. This meant considerable sub-division of the cards falling under each period of service, and the totals are given in Table III.

A more interesting aspect of this part of the investigation is brought to light in Table IV, where the results are expressed as percentages of the total numbers in each time period. In order to make the groups numerically larger, the second and third year cases are taken together, and also those of the fourth and fifth year of underground work.

TABLE III.—SIMPLE TUBERCULOSIS.
 DISTRIBUTION OF A, B, AND C CASES ACCORDING TO SYSTEMIC DISTURBANCE AND TEMPERATURE.
 Total Numbers under each Heading.

Year.	Extent of Disease.	SPUTUM-POSITIVE CASES.							SPUTUM-NEGATIVE CASES.								
		Systemic Symptoms.				Temperature.				Systemic Symptoms.				Temperature.			
		Nil.	S1.	S2.	S3.	Normal.	T+.	T++.	T+++.	Nil.	S1.	S2.	S3.	Normal.	T+.	T++.	T+++.
1st Year	A	—	4	3	6	4	2	4	3	—	2	3	8	3	3	3	4
	B	—	6	10	10	7	8	4	7	—	1	5	13	1	3	9	6
	C	—	3	6	18	3	3	7	14	—	—	—	4	—	—	1	3
2nd Year	A	—	1	2	5	2	—	1	5	—	1	—	—	1	—	—	—
	B	—	4	4	9	3	4	7	3	—	1	3	8	2	1	7	2
	C	—	2	6	10	1	9	4	4	—	1	2	4	3	1	1	2
3rd Year	A	—	6	2	3	8	1	1	1	—	—	—	—	—	—	—	—
	B	—	5	10	9	12	6	4	2	—	1	6	4	3	3	5	—
	C	—	5	4	10	5	3	6	5	—	2	—	5	2	—	2	3
4th Year	A	1	1	4	—	3	3	—	—	—	—	1	1	—	—	—	—
	B	1	10	13	12	14	8	9	5	—	1	4	1	1	1	3	1
	C	—	7	10	16	10	14	7	2	—	—	1	2	1	—	1	1
5th Year	A	—	2	2	2	5	—	—	1	—	—	1	—	—	—	—	1
	B	—	4	9	7	6	6	6	2	—	1	2	4	1	3	1	2
	C	—	6	9	9	6	9	3	6	—	—	3	—	3	—	—	—
Over 5 Years	A	3	7	9	3	13	6	2	1	—	—	—	3	2	—	1	—
	B	—	6	17	14	15	7	11	4	—	6	2	5	7	1	4	1
	C	1	4	17	23	12	14	15	4	—	2	4	3	5	1	3	—
Grand Total		392				392				120				120			

Systemic Disturbance, Stages { Nil.
 S1=Slight Disturbance.
 S2=Moderate Disturbance.
 S3=Severe Disturbance. }

Temperature. { Normal.
 Minimal Pyrexia T+.
 Moderate Pyrexia T++.
 Marked Pyrexia T+++ }

TABLE IV.—SIMPLE TUBERCULOSIS.

PERCENTAGE DISTRIBUTION OF CASES ACCORDING TO SYSTEMIC DISTURBANCE AND TEMPERATURE AND ACCORDING TO PERIODS OF WORK ON THE MINES.

YEARS	SPUTUM-POSITIVE CASES.								SPUTUM-NEGATIVE CASES.							
	Systemic Symptoms.				Temperature.				Systemic Symptoms.				Temperature.			
	Normal.	S1.	S2.	S3.	Normal.	T+.	T++.	T+++.	Normal.	S1.	S2.	S3.	Normal.	T+.	T++.	T+++.
1st Year ...	—	20	28	52	21	20	23	36	—	8	22	70	11	17	36	36
2nd and 3rd Years ...	—	23	28	48	32	24	24	20	—	15	30	55	30	13	39	18
4th and 5th Years ...	1	24	38	37	35	32	20	13	—	10	52	38	33	19	24	24
Over 5 Years	4	16	41	39	38	26	27	9	—	32	24	44	56	8	32	4

Systemic Disturbance $\left\{ \begin{array}{l} \text{Nil} \\ \text{Slight Disturbance} = \text{S1.} \\ \text{Moderate } \text{''} = \text{S2.} \\ \text{Severe } \text{''} = \text{S3.} \end{array} \right\}$

Temperature $\left\{ \begin{array}{l} \text{Normal} \\ \text{Minimal Pyrexia} = \text{T+} \\ \text{Moderate } \text{''} = \text{T++} \\ \text{Marked } \text{''} = \text{T+++} \end{array} \right\}$

In this table an interesting result comes to light, the first-year boys proving to include a higher percentage of cases with severe systemic disturbance, and a higher proportion of markedly pyrexial cases than the boys with longer periods of mine service. In the case of temperature, the first-year boys, both in the sputum-positive and the sputum-negative groups, present 36 per cent. of T+++ cases, while, in the case of boys with mine-service of over five years, the percentages are only 9 and 4 respectively. In the same way, the proportion of cases with a *normal* temperature *increases* with years of service; and the same is true, in the sputum-negative group, for cases with "slight" systemic disturbance only. It is probable that the secondary infections incidental to open cases have obscured a similar tendency in the sputum-positive group.

This increased power of holding in check the more severe types of pyrexia and of limiting the tendency to loss of flesh and general health appears to be characteristic of the older mine boys and suggests that the latter have acquired, in the course of some years' exposure to tuberculous contact on the Rand, some degree of resistance sufficient, if not to bring the disease to a standstill, at least to ameliorate its worst manifestations.

5. In the tuberculo-silicotic series, similar card entries were made but, in view of the suggestions of Professor Dalton as to the advisability of regarding this group as statistically distinct, the 250 cases of this type have been tabulated separately. As was to be expected, these cases fall almost exclusively into the "five years" and "over five years" service groups. Those returned as having shorter mine service are open to some suspicion of inaccuracy in that respect. An analysis of the 250 cards is given in Tables V, VI, and VII.

In this group the same tendency to keep the temperature within normal limits is evident in the long-service boys, especially in the sputum-negative cases where the chance of secondary infection with catarrhal organisms is less than in the "open" cases.

6. In attempting to draw conclusions from these records, it is to be remembered that only those cases with an X-ray film could be included, the more severe cases of simple tuberculosis dying in the mine hospitals or the W.N.L.A. hospital without the possibility of X-ray photography were necessarily excluded. Had these cases been added, it might have been expected that they would have still further accentuated the evidence of lack of resistance manifested by the "first year" boys as compared to the cases contracting tuberculosis after a longer acclimatization to mining conditions.

The investigation, as far as it goes, serves to show that the "new" mine Natives tend towards a very acute and severe type of disease, whereas the "long-service" boys learn to tolerate tuberculosis to a greater extent. In this respect, these clinical observations fall into line with the pathological findings of Mavrogordato and Pirie as well as the statistical studies of Professor Dalton.

TABLE V.
TUBERCULOSIS WITH SILICOSIS.
Distribution of Cases by Years of Service.

Years.	Sputum-Positive.	Sputum-Negative.
1st year	—	—
2nd year	2	1
3rd year	4	2
4th year	11	2
5th year	19	1
Over 5 years	176	32
Totals	212	38

TABLE VI.
TUBERCULOSIS WITH SILICOSIS.
Distribution of Cases according to extent of Tuberculous Lesions.
(A, B and C have the same meanings as in Table II.)

Years.	Sputum-Positive.			Sputum-Negative.		
	A.	B.	C.	A.	B.	C.
1st year	—	—	—	—	—	—
2nd year	—	2	—	—	1	—
3rd year	—	1	3	—	1	1
4th year	—	8	3	—	2	—
5th year	4	5	10	—	1	—
Over 5 years	15	75	86 =176	2	19	11 =32
Totals	212			38		

TABLE VII.—TUBERCULOSIS WITH SILICOSIS.
 DISTRIBUTION OF A, B AND C CASES ACCORDING TO SYSTEMIC DISTURBANCE AND TEMPERATURES.
 (Total Numbers under each Heading.)

Year.		SPUTUM-POSITIVE.							SPUTUM-NEGATIVE.								
		Nil.	S1.	S2.	S3.	Normal.	T+.	T++.	T+++.	Nil.	S1.	S2.	S3.	Normal.	T+.	T++.	T+++.
1st Year ...	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2nd Year ...	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	B	—	—	1	1	2	—	—	—	—	—	—	1	1	—	—	—
	C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3rd Year ...	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	B	—	—	1	—	—	—	1	—	—	—	1	—	—	—	—	1
	C	—	1	—	2	1	2	—	—	—	—	1	—	1	—	—	—
4th Year ...	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	B	—	1	5	2	5	2	1	—	—	1	—	1	1	—	—	—
	C	—	—	3	—	1	1	1	—	—	—	—	—	—	—	—	—
5th Year ...	A	1	1	1	1	3	—	—	1	—	—	—	—	—	—	—	—
	B	—	1	4	—	2	2	1	—	—	—	1	—	1	—	—	—
	C	—	2	4	4	5	2	2	1	—	—	—	—	—	—	—	—
Over 5 Years	A	—	7	6	2	10	3	2	—	—	—	1	1	1	—	1	—
	B	—	24	31	20	40	18	5	12	—	7	4	8	10	3	3	3
	C	—	12	28	46	24	18	21	22	—	3	3	5	7	2	2	—
Per cent. over 5 Years	—	24	37	39	42	22	16	20	—	31	25	44	56	16	19	9

Card used for the purpose of the investigation.

TUBERCULOSIS RESEARCH COMMITTEE.

SIMPLE PULMONARY TUBERCULOSIS. Card No.
Tax Index No. (Cases of Tuberculosis of other Organs only not included.) Disc No.

Name Tribe PP No.
Bureau No. Mine Mine No.

Last worked underground Date admitted Mine Hospital

Year of Service underground 1st 2nd 3rd 4th 5th over 5.

Extent of Disease A. Minimal B. Moderate. C. Maximal. M. Miliary. O.O. Other Organs

Systemic Disturbance, NIL— (1) Slight (2) Moderate (3) Severe

Sputum, positive ; negative ; not examined.

Temperature, normal ;
" +, ++, +++.

Final Classification

Repatriated, Date Died, Date

NOTE.—Strike out all inappropriate items under each heading. A temperature of 99-4°F. on more than one day during the last two weeks of observation to be recorded as Temp. +. The extent of disease to be determined by radiographic examination.

EXAMPLE.—A case of moderate extent, with moderate systemic disturbance, in which the sputum was positive, and temperature was "plus," and with over 5 years' service, would be returned in Final Classification as "B, S(2), T+, Sp+, 5+."

APPENDIX NO. 9.

REPORT ON THE EXAMINATION OF 500 X-RAY FILMS FROM "NEW" MINE NATIVES.

BY PROFESSOR LYLE CUMMINS.

Through the kind assistance of Dr. A. I. Girdwood, and also, during his absence, of Dr. Young and Dr. Watkins of the W.N.L.A. Medical Staff, I have been enabled to examine X-ray films from 500 Native mine recruits, all "new" boys, arriving for service on the Rand and passed as fit for mine work.

In order to record any abnormal appearances on systematic lines rough "Forms" were prepared on which the patient's W.N.L.A. number and the date of X-ray examination were entered, for each film, together with such entries as were thought justified under the following headings:—

"Old Foci," "Glands definite," "Glands suspicious,"

"Peri-Mediastinal Opacities," "Lung Infiltration" and

"Other Pathological appearances"

The results are set forth in the following tabular statement:—

Lesions Visible.	Number.	Per Cent.
Old (Calcareous) Foci	168	32.6
Glands (Broncho-pulmonary or Root), Definite	12	2.4
Glands (Broncho-pulmonary or Root), Suspicious	39	7.8
Peri-mediastinal Opacities	27	5.4
Lung Infiltration	21	4.2
Other Pathological Appearances	58	11.6

Of much importance is the observation that no less than 32 per cent. of "new" boys arrive with radiological evidence of previous respiratory infection with tuberculosis. The lesions were fairly easy to detect as rounded opacities, usually under 15m.m. in diameter, and situated in various parts of the lung without any special preference for the apices. Their tuberculous nature has been verified in recent months by the combined radiological and pathological researches of Mavrogordato and Pirie who have applied Opie's technique with interesting results.

The small percentage of definitely visible broncho-pulmonary and outer root glands is to be noted and corresponds with recent findings at the Laennec Hospital in Paris, where it has been shown that the more important deep tracheo-bronchial glands, even if enlarged, are hidden by the great vessels and the mediastinum and lost in the deep shadows of the vertebral column and sternum.

Even with the help of X-rays, it is impossible either to diagnose with certainty or to exclude tuberculous enlargement of the tracheo-bronchial glands. In a fairly high proportion of the films, there were appearances *suggestive* of glandular enlargement or of such a widening of the central thoracic shadows or such irregularities in the outlines of the mediastinum as to suggest some degree of glandular enlargement, itself invisible but pressing surrounding structures outwards. In recording these appearances, merely suggestive of abnormality but not by any means diagnostic, I desire to express my uncertainty as to their exact significance. Through the kindness of Dr. Girdwood, I am bringing home with me a series of films chosen at random, to compare with X-ray films of "healthy" coal-miners, in the hope that the comparison may afford some grounds for judgment.

The recording of 4.2 per cent. of "lung infiltration," again, while it might be better to express it as "no less than 95.8 per cent. of films quite free from lung infiltration," is less suggestive than it seems, as it is quite likely that some of these opacities were, in reality, postural and not pathological at all.

Of the "other pathological appearances," all except one, suggestive of old pleurisy, were varying degrees of what Dr. L. G. Irvine calls "more fibrosis than usual." It is probable that some, at least, of these increased peri-bronchial shadows were due to inhalation of dust, not in industry but in the every-day life of a dusty country.

APPENDIX NO. 10.

SUMMARY OF INFORMATION RECEIVED FROM VARIOUS MUNICIPALITIES
RE PREVALENCE OF TUBERCULOSIS IN ANIMALS.*Bloemfontein.*

Totals of cattle slaughtered not given, but over five complete years (1924-29) the percentage of tuberculous animals averaged 0.33 per cent. per annum.

Cape Town.

Total of cattle slaughtered not given, but of 8,348 cows slaughtered during the year ended 30th June, 1929, there were 67 showing tuberculous lesions, *i.e.*, 0.80 per cent. It is stated that the majority of cows slaughtered were veld-bred, only a few being dairy cows and these mainly animals which had reacted positively to a tuberculin test.

Durban.

For nine years (1921-29) the average number of cattle slaughtered annually was 29,800, and the average incidence of tuberculosis in them was 0.053 per cent. per annum. It is stated that very few of these animals came from dairy herds, only positive reactors within the borough going to the abattoir. Further stated that approximately 5 per cent. of milk samples tested had shown the presence of tubercle bacilli, and that it was estimated on the basis of tuberculin tests that approximately 15 per cent. of raw milk-supplying dairy herds locally were tuberculous.

East London.

Tuberculosis in bovines reported to be almost non-existent, only three cases having been seen in seven years. Total number of animals slaughtered not given. Rarity attributed to the fact that very few cattle in the district were stall-fed, their whole lives being spent in the open.

Johannesburg.

	Totals Slaughtered.	Infected with Tuberculosis.	Percentage.
Total Cattle during period 1910-29 ...	1,823,278	1,450	0.079
Bulls, Oxen, etc., period 1917-29 ...	1,067,700	330	0.031
Cows, chiefly of Native and Afrikaner Breeds, period 1917-29 ...	228,435	347	0.152
Pigs, period 1910-29 ...	789,335	2,524	0.319

Remarked that the table only shows the incidence in slaughter stock and is not indicative of prevalence in dairy herds.

Pietermaritzburg.

19,120 cattle slaughtered during two complete years (1927-29) and 26 of these were found to be tuberculous. This gives a figure of 0.065 per cent. per annum. It is reported also that tuberculosis was common in pigs; for the year ended 30th June, 1929, 1.53 per cent. being tuberculous.

Port Elizabeth.

For the three years 1926-28 there were 9 cows found to be tuberculous out of 6,675 slaughtered. This gives a figure of 0.046 per cent. per annum. Figures for total cattle not given.

Pretoria.

For the year ended 30th June, 1929, there were 43 cases of tuberculosis in 24,422 cattle slaughtered, *i.e.*, 0.176 per cent. A considerable proportion of these were in cows from dairy herds. Considering cows alone, there were 18 cases amongst dairy cows and 8 in other cows; 26 in all, out of 5,112 cows slaughtered, *i.e.*, 0.51 per cent. Pigs showed 46 cases out of 6,808 slaughtered, *i.e.*, 0.67 per cent.

Considering these reports as a whole, the incidence of tuberculosis amongst cattle in South Africa, as shown by the figures for slaughter stock, appear to be very small.

Little exact information is available as to the incidence in dairy herds but the indications, so far as they go, are that the incidence amongst these stall-fed cows is higher (perhaps much higher) than among cattle generally.

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