



**NATIONAL HEALTH
LABORATORY SERVICE**

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Pathology Division Surveillance Report

Demographic Data and Disease Rates for January to December 1989

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NIOH Report 22/2011

http://www.nioh.ac.za/publications/publications_pathaut_reports.htm

ACKNOWLEDGEMENTS

We thank the all the staff members of the NIOH Pathology Department, for their invaluable contribution to the autopsy service:

We also thank Lizet Vermaak for collating and Prof Tony Davies for editing the manuscript.

EXECUTIVE SUMMARY

During 1989, 3 288 cases came to autopsy at the NIOH. Of these, 65.0% were black men, 33.2% were white, 1.8% were coloured.

Overall disease rates (per 1000 autopsies) for 1989 are shown in Figure 1.

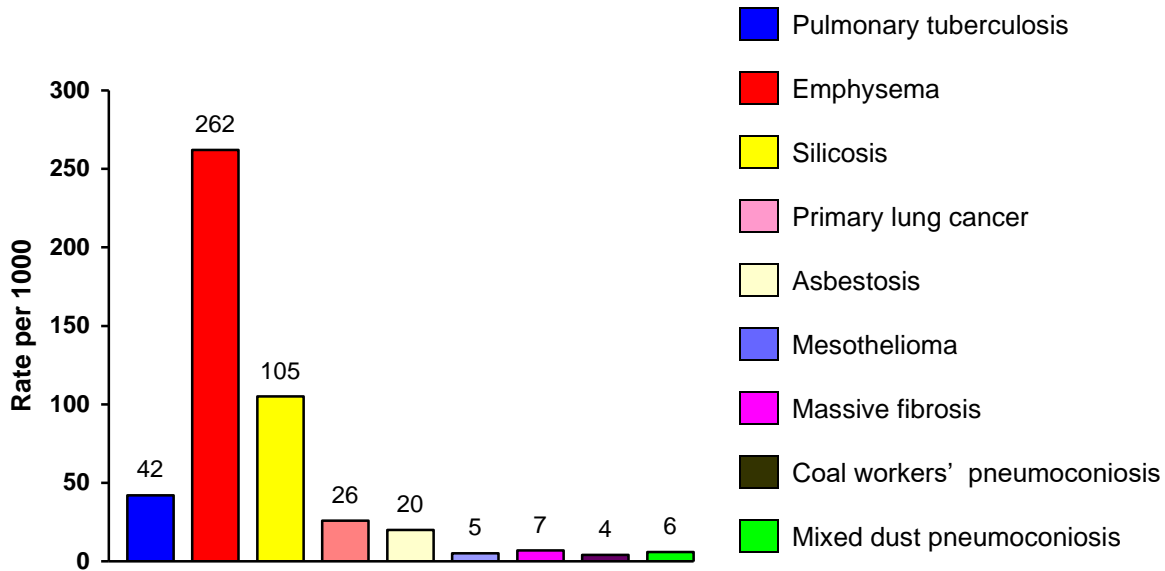


FIG 1 OVERALL DISEASE RATES FOR 1989

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GLOSSARY

Asbestosis	Lung fibrosis caused by asbestos fibres
Coal workers' pneumoconiosis	Lung fibrosis caused by exposure to coal dust
Emphysema	Lung disease caused by the destruction of the alveolar walls
Massive fibrosis	Lung fibrosis caused by exposure to dust and measuring more than 1 cm in diameter
Mesothelioma	A malignant tumour of the pleural cavity of the lungs
Miner	A person who has worked in a controlled mine or works
Mixed exposures	The multiple dust types to which a miner may be exposed, having worked in several mining commodities in his lifetime
Prevalence	The number of cases in a defined population at a given time
Silicosis	Lung fibrosis caused by inhalation of silica dust; detected by the presence of silicotic nodules in the lung tissue
Surveillance	The ongoing and systematic collection, analysis and interpretation of data related to adverse health outcomes

SECTION 1 – BACKGROUND

The Occupational Diseases in Mines and Works Act, 1973 (Act 78 of 1973) requires that the cardio-respiratory organs of a deceased person who has worked at a controlled mine or a controlled works be examined for the presence of occupational disease, regardless of the clinical cause of death and provided that the next of kin agrees. These examinations are performed by pathologists at the National Institute for Occupational Health (NIOH). A detailed report on each case examined is sent to the Medical Bureau for Occupational Diseases (MBOD). Cases certified as having a compensable disease are then referred to the Compensation Commissioner's office, where the payment for compensation is managed.

Since 1975, the pathological findings from the autopsy examinations have been recorded on the computerised PATHAUT database. PATHAUT comprises data from autopsy examinations and clinical files which include occupational histories. The database is unique and provides an important resource for both surveillance and research. These data are the only comprehensive surveillance data on occupational lung disease in the South African mining industry.

The data presented in this report summarise the PATHAUT system surveillance results, i.e. the results of the systematic collection, collation, and analysis of the pathology findings in the cardio-respiratory organs of mine workers. Data from PATHAUT are exported into, and analysed, using SAS v9.1.

This report describes autopsy cases examined during the year 1989. This and other annual reports can be accessed at www.nioh.ac.za.

Many of the cases had "mixed" exposures in that they had been employed in more than one commodity. For simplicity, cases are categorised according to the commodity in which most years of service were recorded, i.e. the commodity in which the miners had worked for the longest period.

All disease rates reported in this document are expressed per 1000. In all calculations, the denominators used are the total numbers of autopsies in specific commodities, age groups or population groups. Some of these rates must be viewed with caution, as the denominators are very small. This applies, for example, to those commodities where few workers are employed (such as manganese mining), and to the older age groups in some instances.

SECTION 2 – DEMOGRAPHIC DATA

The number of autopsies performed since 1989 is presented in Table 2-1.

TABLE 2-1 DISTRIBUTION OF AUTOPSIES BY YEAR AND POPULATION GROUP (1975 - 1989)

Year of autopsy	Black		White		Coloured		Unknown		Total N
	N	%	N	%	N	%	N	%	
1975	2 190	71	854	28	32	1			3 076
1976	2 335	68	1 072	31	27	1			3 434
1977	2 351	69	1 039	30	33	1			3 423
1978	2 245	67	1 090	32	32	1			3 367
1979	2 118	66	1 026	33	45	1			3 189
1980	2 338	64	1 274	35	46	1			3 658
1981	2 209	66	1 117	33	33	1			3 359
1982	2 312	63	1 302	36	44	1	1		3 659
1983	2 096	65	1 109	34	41	1			3 246
1984	1 966	64	1 098	36	28	1			3 092
1985	2 275	64	1 200	34	66	2			3 541
1986	2 456	68	1 125	31	45	1			3 626
1987	2 594	68	1 168	30	78	2			3 840
1988	2 518	67	1 165	31	77	2			3 760
1989	2 138	65	1 090	33	60	2			3 288
Total	34 141	66	16 729	32	687	1	1		51 558

It is important to note that a referral bias exists: there is a low autopsy rate for black men who have left employment at the mines, whereas the majority of white retired miners come to autopsy.

The pathologists at the NIOH perform two types of autopsy examinations. For men dying distant from Johannesburg, the cardio-respiratory organs are removed locally, preserved in formalin and sent to the NIOH. Full autopsies are undertaken on men who die close to Johannesburg.

Table 2-2 shows the distribution of autopsies by population group for 1989. Autopsies of only the cardio-respiratory organs comprised 86.1% of all examinations.

TABLE 2-2 NUMBER AND PROPORTION OF AUTOPSIES BY TYPE AND POPULATION GROUP (1989)

Autopsy type	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
Cardio-respiratory organs only	2 010	94.0	763	70.0	59	98.3	2 832	86.1
Full autopsy	117	5.5	322	29.5	1	-	440	13.4
Not stated	11	0.5	5	0.5	0	-	16	0.5
Total	2 138		1 090		60		3 288	

The age distribution of autopsies for 1989 is shown in Table 2-3 and Figure 2-1. The mean age at autopsy of black men was 43.6 years. The mean age of white men at autopsy was 59.7 years.

TABLE 2-3 NUMBER AND PROPORTION OF AUTOPSIES BY AGE AND POPULATION GROUP (1989)

Age group (years)	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
<20	9	0.4	5	0.5	0	-	14	0.4
20-29	515	24.1	49	4.5	1	1.7	565	17.2
30-39	667	31.2	67	6.1	3	5.0	737	22.4
40-49	464	21.7	118	10.8	7	11.7	589	17.9
50-59	310	14.5	214	19.6	17	28.3	541	16.5
60-69	67	3.1	280	25.7	10	16.7	357	10.9
70-79	10	0.5	280	25.7	10	16.7	300	9.1
80+	3	0.1	76	7.0	10	16.7	89	2.7
Unknown	93	4.3	1	0.1	2	3.3	96	2.9
Total	2 138		1 090		60		3 288	

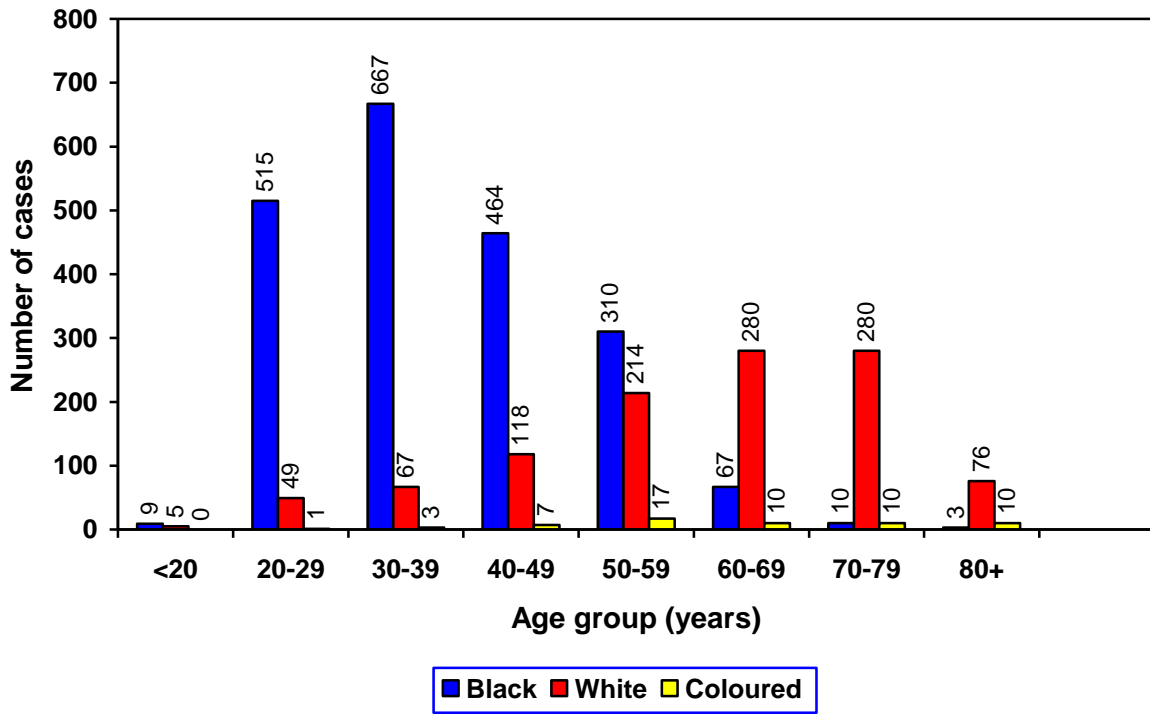


FIG 2-1 DISTRIBUTION OF AUTOPSIES BY AGE AND POPULATION GROUP (1989)

Cases were placed in categories according to the commodity in which they had worked for the longest duration (most exposure). Many men worked in a number of different mining commodities during their lifetimes and had “mixed” exposures. This was not taken into account in the analysis of exposure type (commodity).

Table 2-4 and Figure 2-2 show the distribution of autopsies by commodity and population group for 1989.

TABLE 2-4 NUMBER AND PROPORTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
Gold	1685	78.8	810	74.3	5	8.3	2 500	76.0
Platinum	174	8.1	42	3.9	0	-	216	6.6
Coal	168	7.9	73	6.7	0	-	241	7.3
Asbestos	28	1.3	33	3.0	53	88.3	114	3.5
Iscor	5	0.2	66	6.1	0	-	71	2.2
Diamond	19	0.9	13	1.2	0	-	32	1.0
Copper	2	0.1	17	1.6	1	1.7	20	0.6
Other	6	0.3	8	0.7	0	-	14	0.4
Unknown	51	2.4	28	2.6	1	1.7	80	2.4
Total	2 138		1 090		60		3 288	

NOTE: This table shows only those commodities where a total of 10 or more cases were received

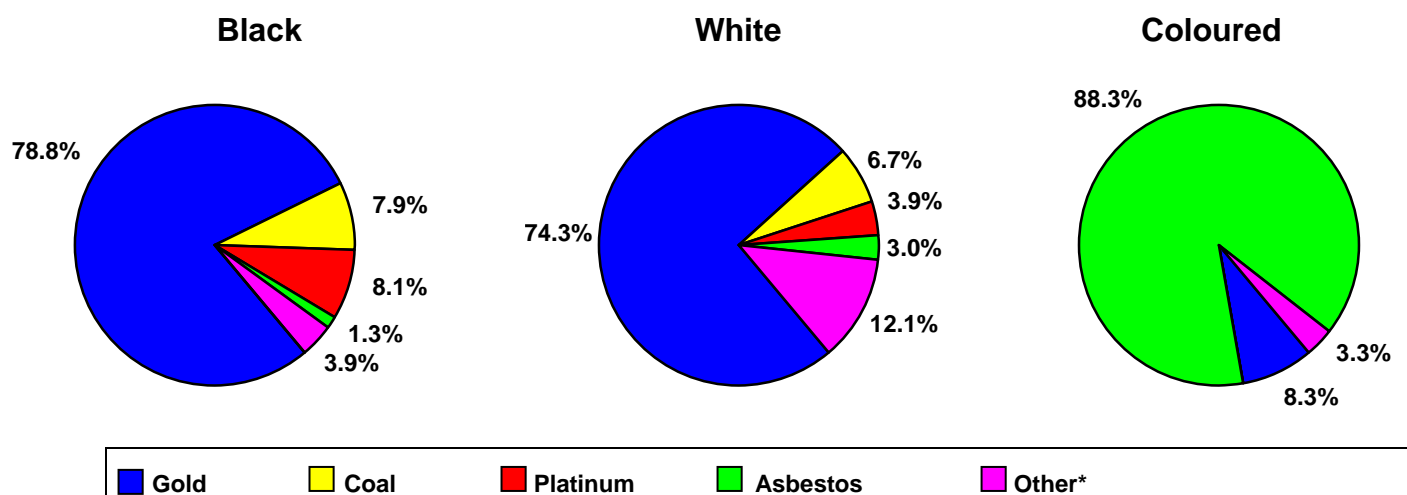
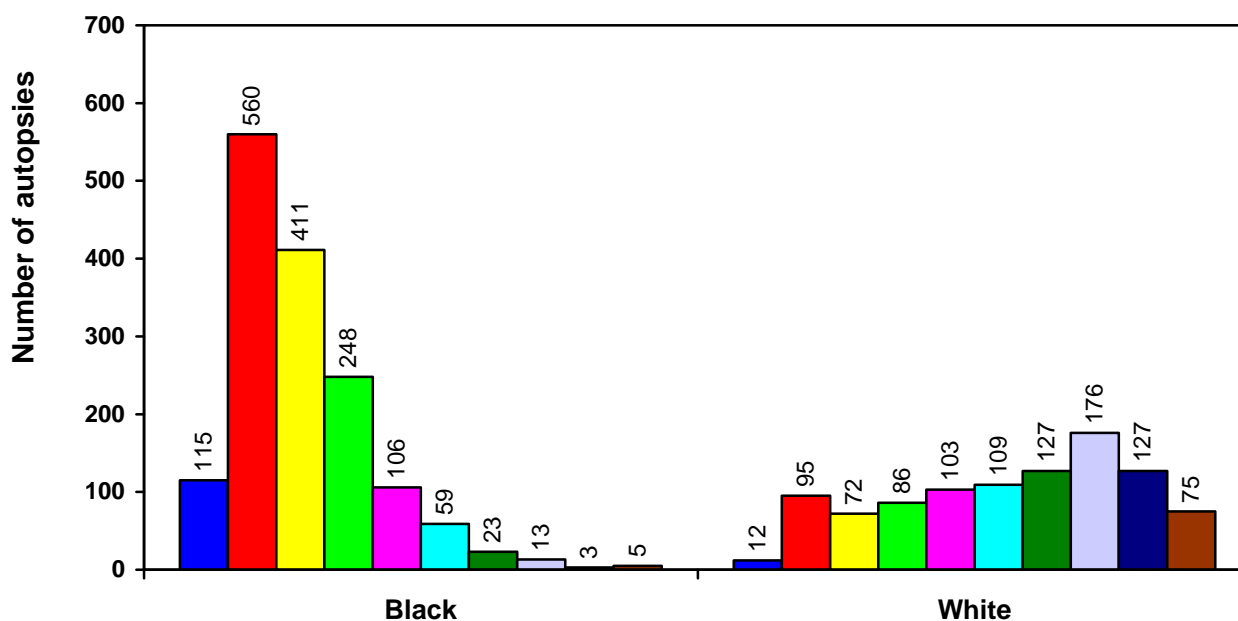


FIG 2-2 DISTRIBUTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (1989)

Detailed information about the years in mining service by population group is presented in Table 2-5 and Figure 2-3.

TABLE 2-5 NUMBER AND PROPORTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (1989)

Years of service	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
<1	115	5.4	12	1.1	2	3.3	129	3.9
1-5	560	26.2	95	8.7	8	13.3	663	20.2
6-10	411	19.2	72	6.6	16	26.7	499	15.2
11-15	248	11.6	86	7.9	5	8.3	339	10.3
16-20	106	5.0	103	9.4	6	10.0	215	6.5
21-25	59	2.8	109	10.0	5	8.3	173	5.3
26-30	23	1.1	127	11.7	5	8.3	155	4.7
31-35	13	0.6	176	16.1	4	6.7	193	5.9
36-40	3	0.1	127	11.7	2	3.3	132	4.0
41+	5	0.2	75	6.9	0	-	80	2.4
Unknown	595	27.8	108	9.9	7	11.7	710	21.6
Total	2 138		1 090		60		3 288	



Years of service:

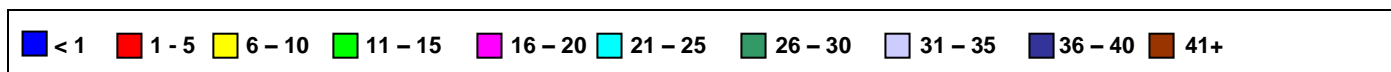


FIG 2-3 DISTRIBUTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (1989)

The mean age and duration of service by commodity type and population group for those cases for which information was available are shown in Tables 2-6 and 2-7.

TABLE 2-6 MEAN AGE BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black			White		
	N	Mean (years)	SD*	N	Mean (years)	SD*
Gold	1 605	37.7	10.9	810	61	15.8
Platinum	173	37.1	11.0	42	56.4	15.4
Coal	162	41.8	11.5	73	59.5	14.8
Asbestos	27	50.4	15.2	33	58.9	14.1
Iscor	5	47.4	8.9	66	60.1	11.1
Diamond	18	40	12.9	13	66.4	9.7
Copper	2	42	11.3	17	59.4	11.9
Other	6	48.8	8.4	8	60.5	10
Unknown	47	47.0	12.8	27	55.5	12.1
Total	2 045	43.6	11.4	1 089	59.7	12.8

* Standard deviation

TABLE 2-7 MEAN DURATION OF SERVICE BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black			White		
	N	Mean (years)	SD*	N	Mean (years)	SD*
Gold	1 247	8.7	7.2	751	26.1	12.4
Platinum	139	5.3	3.7	35	16.1	11.1
Coal	106	10.1	7.4	66	20.6	13.1
Asbestos	14	12.4	12.5	26	16.5	9.4
Iscor	0	-	-	52	23.5	11.2
Diamond	12	6.1	9.5	13	18.7	10.4
Copper	0	-	-	17	16.6	5.4
Other	6	14.8	8.6	5	11.0	6.2
Unknown	19	10.0	9.0	17	16.2	11.6
Total	1 543	9.6	8.3	982	18.4	10.1

* Standard deviation

SECTION 3 – ACTIVE TUBERCULOSIS

The distribution of active tuberculosis (TB) by anatomical site is presented in Figure 3-1 (n=194). Active pulmonary TB (PTB) was diagnosed in 4.2% (138) of all cases autopsied in 1989. Most of the men with PTB were black (83.3%; 115 cases), 14.4% (20 cases) were white, and 2.2% (3 cases) were coloured.

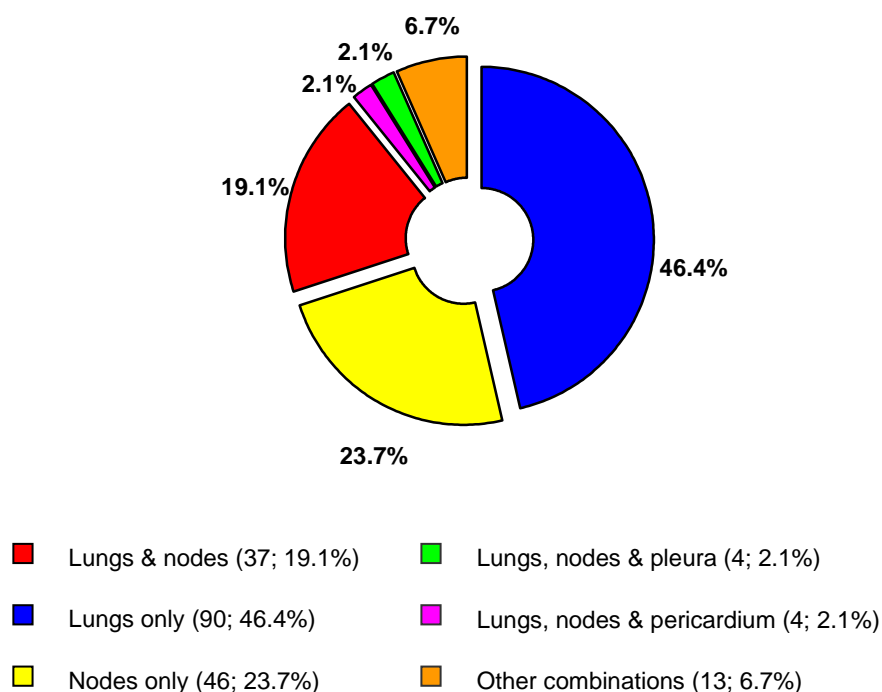


FIG 3-1 DISTRIBUTION OF ACTIVE TB BY SITE (1989)

The distribution of active PTB cases by commodity is shown in Table 3-1. The rates in this and subsequent tables and figures are expressed per 1000. The majority of active PTB cases (84.1%) came from the gold mining industry (76.0% of all autopsy cases came from that commodity).

TABLE 3-1 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	101	60	15	19	0	-	116	46
Platinum	5	29	0	-	0	-	5	23
Coal	4	24	0	-	0	-	4	17
Asbestos	0	-	3	91	3	57	6	53
Isacor	0	-	1	15	0	-	1	14
Copper	0	-	1	59	0	-	1	50
Unknown	5	98	0	-	0	-	5	63
Total	115	54	20	18	3	50	138	42

The age distribution of cases with active PTB is shown in Table 3-2. Most of the cases were between 30-59 years (91 cases=65.9%).

TABLE 3-2 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY AGE AND POPULATION GROUP (1989)

Age group (years)	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
<20	1	111	0	-	0	-	1	71
20-29	9	17	0	-	0	-	9	16
30-39	32	48	1	15	0	-	33	45
40-49	39	84	2	17	1	143	42	71
50-59	20	65	5	23	0	-	25	46
60-69	3	45	5	18	2	200	10	28
70-79	0	-	6	21	0	-	6	20
80+	1	133	1	13	0	-	2	22
Unknown	10	108	0	-	0	-	10	104
Total	115	54	20	18	3	50	138	42

SECTION 4 – SILICOSIS

Silicotic nodules were found in the lungs of 346 cases (10.5% of all autopsies), 94.2% of which came from the gold mining industry. Of all cases of silicosis, occasional silicotic nodules were found in 44.0% of cases, a few in 23.9%, a moderate number in 21.7% and a large number in 10.4%.

The distribution of cases with silicosis by commodity and population group is presented in Table 4-1.

TABLE 4-1 NUMBER OF CASES AND PREVALENCE OF SILICOSIS BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	148	89	177	219	1	200	326	130
Platinum	3	17	2	48	0	-	5	23
Coal	3	18	3	41	0	-	6	25
Asbestos	0	-	1	30	0	-	1	9
Diamond	0	-	1	77	0	-	1	31
Copper	0	-	3	176	0	-	3	150
Iscor	1	500	0	-	0	-	1	14
Other	0	-	0	-	0	-	0	-
Unknown	2	39	1	36	0	-	3	38
Total	157	73	188	172	1	17	346	105

Although the silicosis rates increased with increasing age in both black and white men, the age distribution of cases with silicosis differed between the two population groups (Table 4-2).

TABLE 4-2 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLD MINING INDUSTRY, BY AGE AND POPULATION GROUP (1989)

Age group (years)	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
20-29	1	2	0	-	0	-	1	2
30-39	28	52	0	-	0	-	28	48
40-49	52	149	7	76	0	-	59	134
50-59	49	210	31	218	1	500	81	215
60-69	11	275	41	215	0	-	52	225
70-79	1	250	75	330	0	-	76	329
80+	0	-	23	343	0	-	23	329
Unknown	6	75	0	-	0	-	6	75
Total	148	88	177	219	1	200	326	130

Silicosis was diagnosed in men who were young (<40 years) and in men who were exposed to silica for a few years (< 10 years) (Table 4-3).

TABLE 4-3 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLD MINING INDUSTRY, BY YEARS OF SERVICE AND POPULATION GROUP (1989)

Years of service	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
<1	2	21	0	0	0	-	2	19
1-5	11	26	1	16	0	-	12	24
6-10	33	100	2	50	1	1000	36	97
11-15	34	155	2	36	0	-	36	130
16-20	16	186	11	172	0	-	27	179
21-25	11	208	15	181	0	-	26	191
26-30	4	250	33	333	0	-	37	322
31-35	5	500	56	359	0	-	61	365
36-40	1	333	38	339	0	-	39	339
41+	2	500	17	254	0	-	19	268
Unknown	29	66	2	34	0	-	31	62
Total	148	88	177	219	1	200	326	130

SECTION 5 – OTHER PNEUMOCONIOSES

MASSIVE FIBROSIS

There were 22 (0.7%) cases of massive fibrosis (15 black, 7 white). All cases were from the gold mining industry.

COAL WORKERS' PNEUMOCONIOSIS

There were 13 (0.4%) cases of coal workers' pneumoconiosis of which 12 cases were known to be from the coal mining industry. The commodity of the other case was not stated.

MIXED DUST PNEUMOCONIOSIS

There were 21 (0.6%) cases of mixed dust pneumoconiosis. These cases came from the gold (n=17), asbestos (n=2) and platinum (n=1) mining industries. In one case the industry was not stated.

ASBESTOSIS AND PLEURAL PLAQUES

There were 65 cases of asbestosis of which 50.8% (n=33) had slight, 44.6% (n=29) moderate and 4.6% (n=3) marked fibrosis. Of these, 57 (87.7%) had worked in the asbestos mining industry at some time in their lives. There were 20 cases that had asbestos plaques and 7 (35.0%) of these had asbestosis. Note that the parietal pleura (the site where plaque formation usually occurs) is seldom submitted with the lungs.

The distribution of asbestosis by age and population group is shown in Table 5-1.

TABLE 5-1 NUMBER OF CASES AND PREVALENCE OF ASBESTOSIS BY AGE AND POPULATION GROUP (1989)

Age group (years)	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
30-39	1	1	0	-	0	-	1	1
40-49	9	19	0	-	2	286	11	19
50-59	9	29	10	47	6	353	25	46
60-69	2	30	2	7	5	500	9	25
70-79	2	200	4	14	5	500	11	37
80+	0	-	1	13	5	500	6	67
Unknown	1	11	0	-	1	500	2	21
Total	24	11	17	16	24	400	65	20

SECTION 6 – EMPHYSEMA

There were 861 cases of emphysema, the extent of which was mild in 69.0% (n=594), moderate in 27.0% (n=232) and marked in 4.1% (n=35). The distribution of emphysema by age and population group is presented in Table 6-1.

TABLE 6-1 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY AGE AND POPULATION GROUP (1989)

Age group (years)	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
20-29	14	27	0	-	0	-	14	25
30-39	53	79	8	119	1	333	62	84
40-49	86	185	29	246	2	286	117	199
50-59	77	248	111	519	10	588	198	366
60-69	22	328	170	607	6	600	198	555
70-79	1	100	191	682	5	500	197	657
80+	2	667	52	684	8	800	62	697
Unknown	12	129	0	-	1	500	13	135
Total	267	125	561	515	33	550	861	262

The majority of black and white men with emphysema were from the gold mining industry (74.2%, n=614) (Table 6-2).

TABLE 6-2 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	189	112	425	525	2	400	616	246
Platinum	24	138	19	452	0	-	43	199
Coal	27	161	40	548	0	-	67	278
Asbestos	11	393	13	394	30	566	54	474
Diamond	1	53	8	615	0	-	9	281
Copper	0	-	8	471	0	-	8	400
Isacor	3	600	35	530	0	-	38	535
Other	0	-	2	250	0	-	2	143
Unknown	12	235	11	393	1	1000	24	300
Total	267	125	561	515	33	550	861	262

TABLE 6-3 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY YEARS OF SERVICE AND POPULATION GROUP (1989)

Years of service	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
<1	9	78	3	250	1	500	13	101
1 – 5	34	61	23	242	7	875	64	97
6-10	48	117	22	306	8	500	78	156
11-15	40	161	38	442	3	600	81	239
16-20	24	226	49	476	3	500	76	353
21-25	7	119	66	606	1	200	74	428
26-30	5	217	91	717	4	800	100	645
31-35	2	154	115	653	2	500	119	617
36-40	0	-	72	567	1	500	73	553
41+	2	400	48	640	0	-	50	625
Unknown	96	161	34	315	3	429	133	187
Total	267	125	561	515	33	550	861	262

SECTION 7 – MESOTHELIOMA

There were 15 cases of mesothelioma in 1989

TABLE 7-1 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY AGE AND POPULATION GROUP (1989)

Age group (years)	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
40-49	6	75.0	0	-	0	-	6	40.0
50-59	2	25.0	4	57.1	0	-	6	40.0
60-69	0	-	2	28.6	0	-	2	13.3
70-79	0	-	0	-	0	-	0	-
80+	0	-	1	14.3	0	-	1	6.7
Total	8		7		0		15	

The distribution of mesothelioma by commodity and population group is presented in Table 7.2. Six (40.0%) had worked in the asbestos mining industry.

TABLE 7-2 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
Asbestos	3	37.5	3	42.9	0	-	6	40.0
Gold	3	37.5	2	28.6	0	-	5	33.3
Platinum	1	0.5	0	-	0	-	1	0.3
Unknown	1	0.5	2	1.7	0	-	3	20.0
Total	8		7		0		15	

SECTION 8 – PRIMARY LUNG CANCER

Eighty five cases of primary lung cancer were found at autopsy, 21.2% of which were in black, 71.8% in white and 7.1% in coloured men. Most of the cases were squamous lung carcinomas (29.4%; n=25), followed by small cell lung carcinoma (28.3%; n=24), large cell lung carcinoma (18.8%; n=16), adeno carcinoma (17.7%; n=15), and broncho-alveolar carcinoma (5.9%; n=5)

The distribution of primary lung cancer by age and population group is presented in Table 8-1.

TABLE 8-1 NUMBERS OF CASES AND PREVALENCE OF PRIMARY LUNG CANCER BY AGE AND POPULATION GROUP (1989)

Age group (years)	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
30-39	1	1	0	-	1	333	2	3
40-49	6	13	2	17	2	286	10	17
50-59	6	19	10	47	1	59	17	31
60-69	1	15	19	68	1	100	21	59
70-79	1	100	24	86	1	100	26	87
80+	0	-	6	79	0	-	6	67
Unknown	3	32	0	-	0	-	3	31
Total	18	8	61	56	6	100	85	26

The distribution of primary lung cancer by commodity and population group is presented in Table 8-2. The majority of cases came from the gold mining industry.

TABLE 8-2 NUMBER OF CASES AND PREVALENCE OF PRIMARY LUNG CANCER BY COMMODITY AND POPULATION GROUP (1989)

Commodity	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	7	4	44	54	0	-	51	20
Platinum	5	29	0	-	0	-	5	23
Coal	2	12	4	55	0	-	6	25
Asbestos	2	71	4	121	6	113	12	105
Diamond	0	-	1	77	0	-	1	31
Copper	0	-	1	59	0	-	1	50
Iscor	0	-	7	106	0	-	7	99
Unknown	2	39	0	-	0	-	2	25
Total	18	8	61	56	6	100	85	26

SECTION 9 – CLINICAL CAUSES OF DEATH

Table 9-1 and Figure 9-1 show the clinical causes of death as stated in the accompanying documents submitted with the cardio-respiratory organs, by population group. Diseases of the cardio-vascular system were the most frequent (12.3%) overall. Black men had the highest proportion of unnatural causes of death (58.7%). In 16.3% of all cases, the cause of death was not stated.

TABLE 9-1 CLINICAL CAUSES OF DEATH BY POPULATION GROUP (1989)

System	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
Respiratory	189	8.8	137	12.6	16	26.7	342	10.4
Cardio-vascular	81	3.8	305	28.0	17	28.3	403	12.3
Central Nervous System	70	3.3	34	3.1	7	11.7	111	3.4
Gastro-intestinal	103	4.8	43	3.9	5	8.3	151	4.6
Genito-urinary	26	1.2	35	3.2	0	-	61	1.9
Haematological	12	0.6	10	0.9	0	-	22	0.7
Unnatural	1 254	58.7	206	18.9	5	8.3	1 465	44.6
Miscellaneous	127	5.9	62	5.7	9	15.0	198	6.0
Not stated	276	12.9	258	23.7	1	1.7	535	16.3
Total	2 138		1 090		60		3 288	

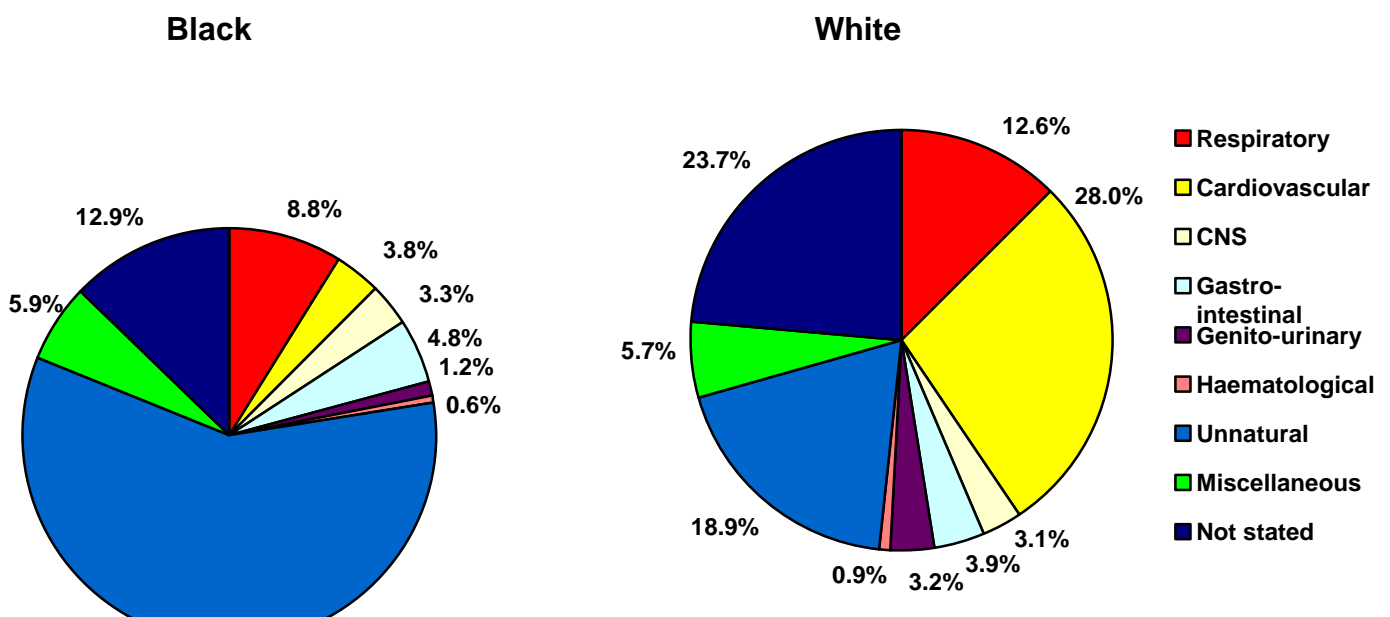


FIGURE 9-1 CLINICAL CAUSE OF DEATH AS STATED BY THE CLINICIANS WHO SUBMIT THE ORGANS OF THE DECEASED TO THE NIOH (1989)