DEPARTMENT OF HEALTH

Pathology Division Report: Demographic Data and Disease Rates for January - December 1999

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NCOH Report

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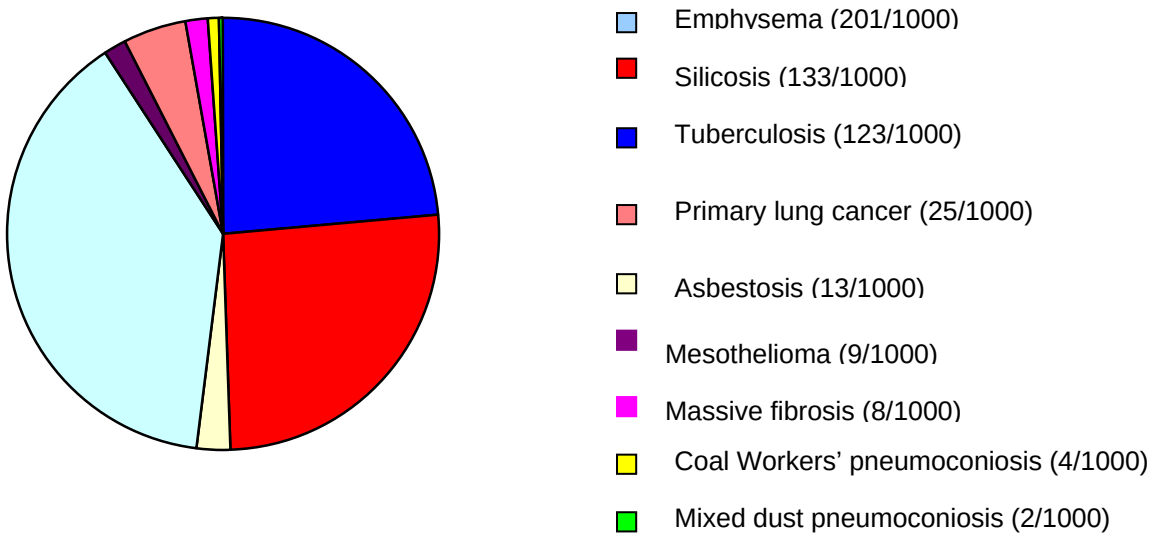
EXECUTIVE SUMMARY

South African law requires the examination of the cardiorespiratory organs of deceased miners and ex-miners for compensation purposes, provided the next of kin agrees. These examinations are performed at the National Centre for Occupational Health (NCOH) and the findings are recorded on a computerized database (PATHAUT). This database provides an important resource for surveillance and research.

During 1999, 2529 cases came to autopsy at the NCOH. Of these, 65.5% were black men, 32.9% whites, 1.1% coloureds and 0.5% were submitted without information on the ethnic group.

Overall disease rates (per 1000 cases) for 1999 are as follows:



SECTION 1 – INTRODUCTION

The Pathology Department of the National Centre for Occupational Health (NCOH) provides an autopsy service for miners and ex-miners to determine the presence of occupational lung disease. Under the Occupational Diseases in Mines and Works Act (ODMWA, 1973) it is obligatory for the last attending doctor to remove the cardiorespiratory organs and send them for examination provided the next of kin agrees. A detailed report of each case is sent to the Medical Bureau for Occupational Diseases (MBOD). Cases certified as having a compensatable disease are then referred to the Compensation Commissioner's office, where payment of compensation is managed.

Since 1975 the pathological findings have been recorded on the PATHAUT database which is a unique computerized source of information for research. PATHAUT combines data from autopsy summary sheets and clinical files (including occupational histories) onto a single database. The structure of this database was changed in 1995/1996 and new programs were written, upgrading and enhancing the existing database by improving the quality of the system and making better use of existing data (SIMRAC Project GEN509).

This is the third of the new format reports and describes autopsy cases examined during 1999.

Data from PATHAUT are exported into the Statistical Analysis System (SAS System) where programs have been written using the Structured Query Language (SQL) permitting the user to analyze data on the SAS System related to any aspect of the PATHAUT database. During 1998 this was done for the 1975-1995 database, converting these data to a similar format as the current PATHAUT database.

SECTION 2 – DATA DESCRIPTION

The number of autopsies performed since 1975 is presented in Table 2-1.

TABLE 2-1 DISTRIBUTION OF AUTOPSIES BY YEAR & ETHNIC GROUP (1975-1999)

Year of	Black		White		Coloured		Indian		Unknown		Total
autopsy	N	%	N	%	N	%	N	%	N	%	N
1975	2190	71	854	28	32	1					3076
1976	2335	68	1072	31	27	1					3434
1977	2351	69	1039	30	33	1					3423
1978	2245	67	1090	32	32	1					3367
1979	2118	66	1026	33	45	1					3189
1980	2338	64	1274	35	46	1					3658
1981	2209	66	1117	33	33	1					3359
1982	2312	63	1302	36	44	1					3658
1983	2096	65	1109	34	41	1					3246
1984	1966	64	1098	35	28	1					3092
1985	2275	64	1200	34	66	2					3541
1986	2456	68	1125	31	45	1					3626
1987	2594	68	1168	30	78	2					3840
1988	2518	67	1165	31	77	2					3760
1989	2138	65	1090	33	60	2					3288
1990	2172	64	1155	34	51	2					3378
1991	2143	65	1080	33	66	2					3289
1992	2144	66	1049	32	70	2					3263
1993	1863	65	956	33	65	2					2884
1994	1737	61	1021	36	94	3					2852
1995	2830	71	1059	27	99	2					3988
1996*	766	68	329	29	19	2			14	1	1128
1997	2223	69	897	28	70	2			18	1	3208
1998	1977	68	836	29	49	2	1	0.03	17	1	2880
1999	1656	65	832	32	29	2			12	1	2529
TOTAL	53652	66	25 943	32	1 299	2	1	0.001	61	0.1	80 956

* Computerized data for only ± 6 months are available for this year

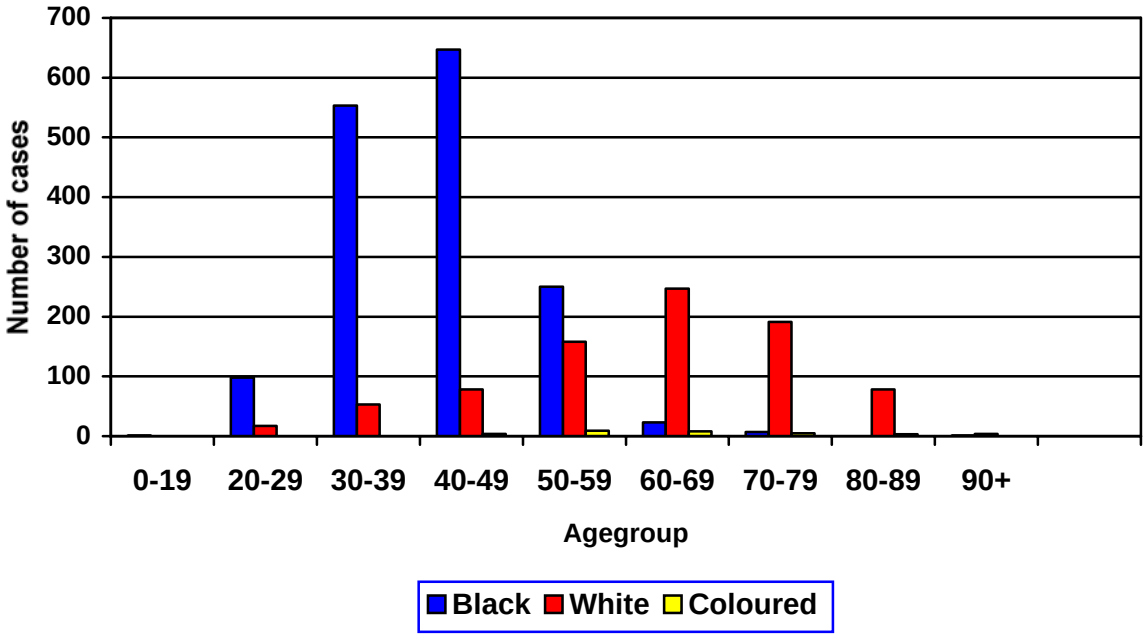
It is important to note that there is a referral bias in that black men are infrequently autopsied after leaving employment in the mines, whereas the majority of whites come to autopsy after retirement.

The age distribution of autopsies for 1999 is shown in Table 2-2 and Fig 2-1. In 1999 the mean age for black miners was 40.1 years (37.9 in 1998) and for white miners 61.8 years (61.3 in 1998)

TABLE 2-2 NUMBERS OF AUTOPSIES BY AGE & ETHNIC GROUP (1999)

Age group	Black		White		Coloured		Unknown		All races	
	N	%	N	%	N	%	N	%	N	%
0-19	1	0.1	0	0.0	0	0.0	0	0.0	1	0.04
20-29	98	5.9	17	2.0	0	0.0	1	8.3	116	4.6
30-39	553	33.4	53	6.4	0	0.0	0	0.0	606	24.0
40-49	647	39.1	78	9.4	4	13.8	0	0.0	729	28.8
50-59	250	15.1	158	19.0	9	31.0	0	0.0	417	16.5
60-69	23	1.4	247	29.7	8	27.6	0	0.0	278	11.0
70-79	7	0.4	191	23.0	5	17.3	0	0.0	203	8.0
80-89	0	0.0	78	9.4	3	10.3	0	0.0	81	3.2
90+	1	0.1	4	0.4	0	0.0	0	0.0	5	0.2
Unknown	76	4.5	6	0.7	0	0.0	11	91.7	93	3.7
Total	1656	100	832	100	29	100	12	100	2529	100

FIG 2-1 DISTRIBUTION OF AUTOPSIES BY AGE & ETHNIC GROUP(1999)



The pathologists at the NCOH perform 2 types of examinations. For men dying distant from Johannesburg, the cardiorespiratory organs are removed locally, preserved in formalin and sent to the NCOH. Full autopsies are undertaken on men who die close to Johannesburg.

Table 2-3 presents the distribution of autopsies by ethnic group for 1999. Autopsies of cardiorespiratory organs only comprised 92.9% of examinations.

TABLE 2-3 NUMBER OF AUTOPSIES BY TYPE & ETHNIC GROUP (1999)

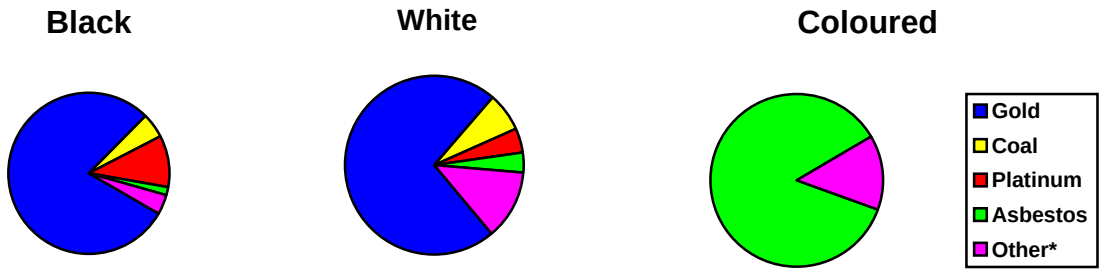
	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Cardiorespiratory organs only	1653	99.8	655	78.7	29	100	12	100	2349	92.9
Full autopsy	3	0.2	177	21.3	0	0	0	0	180	7.1
TOTAL	1656	100	832	100	29	100	12	100	2529	100

Table 2-4 and Figure 2-4 show the distribution of autopsies by industry and ethnic group for 1999. The majority of miners were from the gold mining industry (75.8%). 86.2% of coloured miners came from asbestos mines.

TABLE 2-4 NUMBER OF AUTOPSIES BY INDUSTRY & ETHNIC GROUP (1999)

	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Gold	1312	79.2	603	72.5	0	0.0	2	16.7	1917	75.8
Coal	83	5.0	58	6.9	0	0.0	0	0.0	141	5.5
Platinum	173	10.4	38	4.6	0	0.0	0	0.0	211	8.3
Asbestos	23	1.4	29	3.5	25	86.2	0	0.0	77	3.0
Diamond	11	0.7	6	0.7	0	0.0	0	0.0	17	0.7
Copper	1	0.06	10	1.2	4	13.8	0	0.0	15	0.6
Iscor	1	0.06	18	2.2	0	0.0	0	0.0	19	0.8
Other	34	2.1	46	5.5	0	0.0	0	0.0	80	3.2
Unknown	18	1.1	24	2.9	0	0.0	10	83.3	52	2.1
Total	1656	100	832	100	29	100	12	100	2529	100

FIG 2-4 DISTRIBUTION OF AUTOPSIES BY INDUSTRY & ETHNIC GROUP (1999)



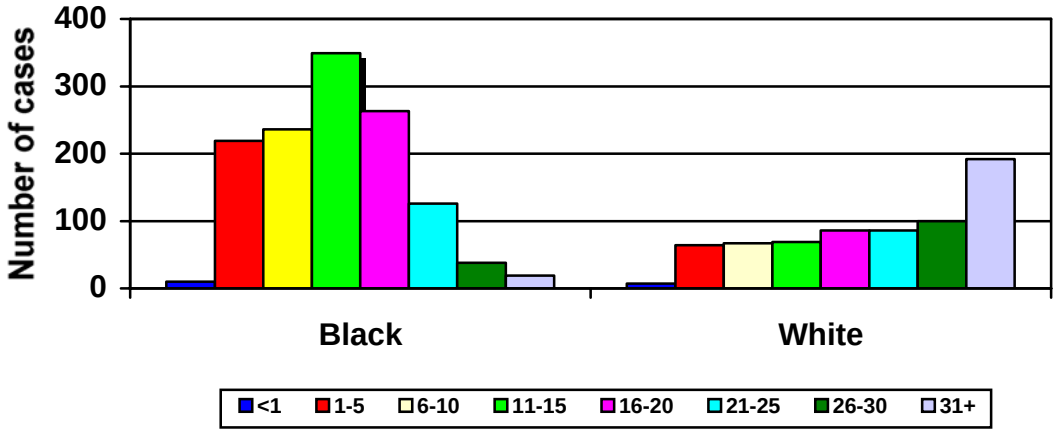
* Includes copper, diamond, quarry, silica (silicon smelters), manganese, tin, zinc, minerals, chrome and iron as well as cases where information about type of mining is missing

Detailed information about the years in mining service by ethnic group is given in Table 2-5. This is also presented in Fig 2-5. Cases are categorized according to the industry in which most years of service occurred. The percentage of cases with missing information on the duration of service is 22.7%, down from 43% in 1998.

TABLE 2-5 NUMBER OF AUTOPSIES BY YEARS OF SERVICE & ETHNIC GROUP (1999)

	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
<1	10	0.6	7	0.8	0	0.0	0	0.0	17	0.7
1-5	219	13.2	64	7.7	6	20.8	0	0.0	289	11.4
6-10	236	14.3	67	8.0	5	17.2	0	0.0	308	12.2
11-15	349	21.1	69	8.3	2	6.9	0	0.0	420	16.5
16-20	263	15.9	86	10.3	6	20.7	0	0.0	355	14.0
21-25	126	7.6	86	10.3	3	10.3	0	0.0	215	8.5
26-30	38	2.3	100	12.0	0	0.0	0	0.0	138	5.5
31+	19	1.1	192	23.2	3	10.3	0	0.0	214	8.5
Missing	396	23.9	161	19.4	4	13.8	12	100	573	22.7
Total	1656	100	832	100	29	100	12	100	2529	100

FIG 2-5 DISTRIBUTION OF AUTOPSIES BY YEARS OF SERVICE & ETHNIC GROUP (1999)



The mean duration of service & age by mining type and ethnic group is shown in Table 2-6.

TABLE 2-6: MEAN DURATION OF SERVICE AND MEAN AGE BY MINE TYPE & ETHNIC GROUP (1999)

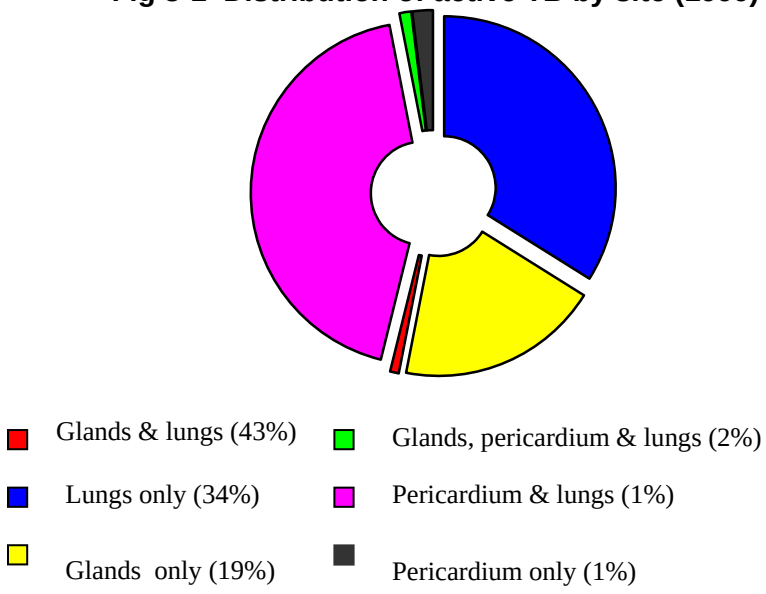
Minetype	Black					White				
	N	Age		Service		N	Age		Service	
		Mean	SD	Mean	SD		Mean	SD	Mean	SD
Gold	1312	39	11.7	10.6	8.3	603	63	15.2	20.2	14.0
Coal	83	45	35.6	5.2	7.8	58	60	16.2	17.0	12.7
Platinum	173	43	8.1	11	8.4	38	58	11.7	14.1	11.3
Asbestos	23	51	13.4	7.9	10.6	29	63	10.7	14.2	14.3
Diamond	11	44	9.5	9.2	12.1	6	67	17.2	24.3	18.0
Copper	1	28	-	0	-	10	65	10.5	13.5	11.7
Iscor	1	53	-	14	-	18	69	8.7	19.5	12.7
Other	34	46	14.5	5.5	7.1	46	56	14	11.4	11.1
Unknown	18	29	25.5	0	0.0	24	55	21.5	0	-
Total	1656					832				

*Duration of service not known

SECTION 3 – ACTIVE TUBERCULOSIS

Active tuberculosis was diagnosed in 15% (387) of all the cases autopsied in 1999 (Fig 3-1), in comparison with the 510 (18%) cases of the previous year. The distribution of tuberculosis (TB) by anatomical site is presented in Fig 3-1. 80% of TB cases had active **pulmonary** tuberculosis (PTB). Of the PTB cases, 88% involved the lungs extensively. 92.9% (288 cases) of PTB cases were black, 5% (16 cases) white, 2% (5 cases) coloured miners and in 0.3% (1 case) the ethnic group was unknown. 75% of all PTB cases came from the gold mines and most of the PTB cases were in the age group 40-49.

Fig 3-1 Distribution of active TB by site (1999)



In 65% of cases of pulmonary tuberculosis found at autopsy, the disease was not mentioned in the clinical notes which were submitted with the organs.

The age distribution of cases with active pulmonary TB is shown in Table 3-1. The difference in age distribution between ethnic groups might be explained by different referral patterns (page 3). The rate of PTB in 1999 (122.6/1000) is lower than in 1998 (149.0/1000).

TABLE 3-1 NUMBER & PREVALENCE OF ACTIVE PTB BY AGE & ETHNIC GROUP (1999)

Age group	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	16	163.3	0	-	0	-	0	-	16	137.9
30-39	92	166.4	1	18.9	0	-	0	-	93	153.5
40-49	124	191.7	3	38.5	1	250.0*	0	-	128	175.6
50-59	38	152.0	3	19.0	2	222.2*	0	-	43	103.1
60-69	1	43.5	4	16.2	0	-	0	-	5	18.0
70-79	2	285.7*	4	20.9	1	200.0*	0	-	7	34.5
80-89	0	-	1	12.8	1	333.3*	0	-	2	24.7
Missing	15	197.4	0	-	0	-	1	90.9	16	172.0
TOTAL	288	173.9	16	19.2	5	172.4	1	83.3	310	122.6

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in specific age group for specific ethnic group

The distribution of active PTB cases by industry is shown in Table 3-2. 75.2% of active PTB cases came from the gold mining industry (75.8% of all autopsy cases came from that industry). The rate of PTB in the gold mining industry of 121.5/1000 is lower than in 1998 (172.0/1000), whereas the rates in all other commodities have increased.

TABLE 3-2 NUMBER & PREVALENCE OF ACTIVE PTB BY INDUSTRY & ETHNIC GROUP (1999)

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	225	171.5	8	13.3	0	-	0	-	233	121.5
Coal	21	253.0	2	34.5	0	-	0	-	23	163.1
Platinum	31	179.2	0	-	0	-	0	-	31	146.9
Asbestos	2	87.0	2	69.0	5	200.0	0	-	9	116.9
Diamond	3	272.7*	1	166.7*	0	-	0	-	4	235.3
Other	5	147.1	1	21.7	0	-	0	-	6	75.0
Unknown	1	55.6	2	83.3	0	-	1	100	4	76.9
TOTAL	288	173.9	16	19.2	5	172.4	1	83.3	310	122.6

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in a specific industry for specific ethnic group

SECTION 4 – SILICOSIS

Silicotic nodules were found in the lungs in 336 cases, 13.3% of all autopsies, compared with 16.0% in 1998. 93.6% of these cases came from the gold mining industry. Of all cases of silicosis, occasional silicotic nodules were found in 39.8%, a few in 17.6%, a moderate number in 26.2% and a large number in 16.4%.

The distribution of cases with silicosis by industry and ethnic group is presented in Table 4-1. As indicated previously, cases are categorized according to the industry in which the most years of service occurred. Cases from the platinum mining industry with silicosis might be explained by unstated previous service in gold mines.

TABLE 4-1 NUMBER & PREVALENCE OF SILICOSIS BY INDUSTRY & ETHNIC GROUP (1999)

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	199	151.7	116	192.4	0	-	0	-	315	164.3
Platinum	3	17.3	3	78.9	0	-	0	-	6	28.4
Coal	2	24.1	0	-	0	-	0	-	2	14.2
Asbestos	2	87.0	0	-	1	40.0	0	-	3	39.0
Diamond	0	-	1	166.7*	0	-	0	-	1	58.8
Iscor	0	-	1	55.6	0	-	0	-	1	52.6
Other	3	88.2	0	-	0	-	0	-	6	75.0
Unknown	2	111.1	2	83.3	0	-	1	100.0*	5	96.2
TOTAL	211	127.4	123	147.8	1	34.5	1	83.3	336	132.9

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in a specific industry and ethnic group

The age distribution of cases from the gold mining industry with silicosis (Table 4-2) differed between ethnic groups.

TABLE 4-2 NUMBER & PREVALENCE OF SILICOSIS IN GOLD MINERS BY AGE & ETHNIC GROUP (1999)

Age group	Black		White		Total	
	N	Rate	N	Rate	N	Rate
0-19	1	1000*	0	-	1	1000*
20-29	1	12.8	0	-	1	11.4
30-39	27	57.1	2	57.1	29	57.1
40-49	105	202.7	3	49.2	108	186.5
50-59	54	323.4	17	149.1	71	252.7
60-69	2	200	32	197.5	34	197.7
70-79	1	500*	30	205.5	31	209.5
80-89	0	-	29	432.8	29	432.8
90+	0	-	1	250*	1	250*
Missing	8	127.0	2	500*	10	144.9
TOTAL	199	151.7	116	192.4	315	164.3

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in specific age group for specific ethnic group

SECTION 5 – MASSIVE FIBROSIS, COALWORKER'S PNEUMOCONIOSIS, MIXED DUST FIBROSIS & ASBESTOSIS

MASSIVE FIBROSIS

There were 20 (0.8%) cases of massive fibrosis (12 black, 8 white) and the majority of them (80%) came from the gold mining industry.

COAL WORKERS' PNEUMOCONIOSIS

There were 11 cases of coal workers' pneumoconiosis most in the age group 60-69 (36%).

MIXED DUST FIBROSIS

There were 5 (0.2%) cases of mixed dust fibrosis of whom 60% came from the gold mining industry.

ASBESTOSIS

There were 34 (1.3%) cases of asbestosis of which 35% had slight interstitial fibrosis, 53% moderate and 12% marked. Amongst all cases with a history of asbestos exposure, there were only 8 in whom asbestos plaques were found. However, the parietal pleura which is usually the site affected by plaque formation is hardly ever submitted with the lungs.

All of the coloured miners with asbestosis came from asbestos mines as did the majority of blacks and whites with this disease.

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

TABLE 5-1 NUMBER & PREVALENCE OF ASBESTOSIS BY AGE AND ETHNIC GROUP (1999)

Age group	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
30-39	1	1.8	0	-	0	-	1	1.7
40-49	3	4.6	0	-	0	-	3	4.1
50-59	7	28.0	1	6.3	2	222.2*	10	24.0
60-69	3	130.4	4	16.2	3	375.0	10	36.0
70-79	0	-	3	15.7	5	1000*	8	39.4
80-89	0	-	1	12.8	1	333.3*	2	24.7
TOTAL	14	8.5	9	10.8	11	379.3	34	13.4

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in specific age group for specific ethnic group

SECTION 6 – EMPHYSEMA

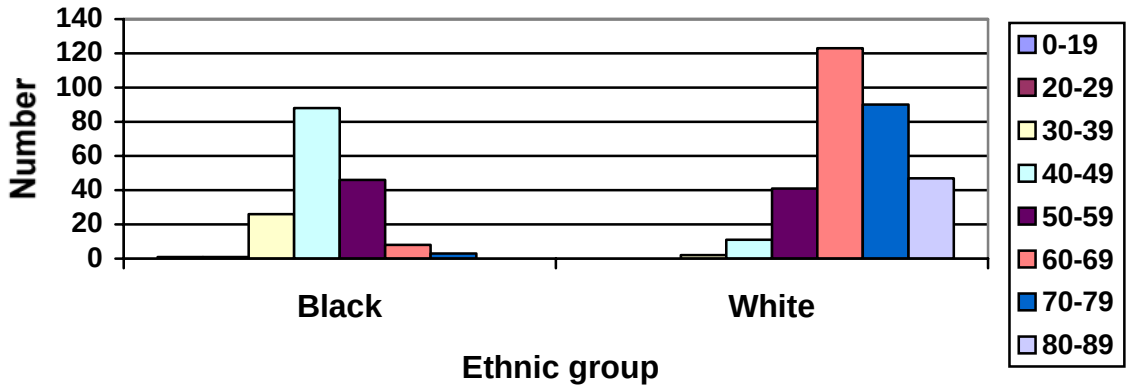
There were 508 cases of emphysema, the extent of which was mild in 63.4%, moderate in 30.9% and marked in 5.7%. The distribution of emphysema by age and ethnic group is presented in Table 6-1 and Fig 6-1.

TABLE 6-1 NUMBER & PREVALENCE OF EMPHYSEMA BY AGE & ETHNIC GROUP (1999)

Age group	Black		White		Coloured		Unknown		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
0-19	1	1000	0	-	0	-	0	-	1	1000
20-29	1	10.2	0	-	0	-	0	-	1	8.6
30-39	26	47.0	2	37.7	0	-	0	-	28	46.2
40-49	88	136.0	11	141.0	2	500.0*	0	-	101	138.5
50-59	46	184.0	41	259.5	2	222.2*	0	-	89	213.4
60-69	8	347.8	123	498.0	2	250.0*	0	-	133	478.4
70-79	3	428.6*	90	471.2	2	400.0*	0	-	95	468.0
80-89	0	-	47	602.6	1	333.3*	0	-	48	592.6
Missing	10	131.6	1	166.7	0	-	1	90.9	12	129.0
TOTAL	183	110.5	315	378.6	9	310.3	1	83.3	508	200.9

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in specific age group for specific ethnic group

FIG 6-1 DISTRIBUTION OF EMPHYSEMA BY AGE & ETHNIC GROUP (1999)



For black and white miners with emphysema, the majority were from the gold mining industry (68%) (Table 6-2), whereas most coloureds came from asbestos mines (most autopsies on coloureds were referred from these mines)

TABLE 6-2 NUMBER & PREVALENCE OF EMPHYSEMA BY INDUSTRY & ETHNIC GROUP (1999)

Industry	Black		White		Coloured		Unknown		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	125	95.3	222	368.2	0	-	0	-	347	181.0
Platinum	22	127.2	15	394.7	0	-	0	-	37	175.4
Coal	21	253.0	23	396.6	0	-	0	-	44	312.1
Asbestos	4	173.9	9	310.3	8	320.0	0	-	21	272.7
Iscor	0	-	14	777.8	0	-	0	-	14	736.8
Copper	0	-	5	500.0	1	250.0*	0	-	6	400.0
Diamond	2	181.8	2	333.3*	0	-	0	-	4	235.3
Other	3	88.2	18	391.3	0	-	0	-	21	262.5
Unknown	6	333.3	7	291.7	0	-	1	100.0	14	269.2
TOTAL	183	110.5	315	378.6	9	310.3	1	83.3	508	200.9

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in a specific industry and ethnic group

TABLE 6-3 NUMBER OF EMPHYSEMA BY YEARS OF SERVICE & ETHNIC GROUP (1999)

Years of service	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
<1	1	100.0	1	142.9	0	-	0	-	2	117.6
1-5	12	54.8	15	234.4	0	-	0	-	27	93.4
6-10	18	76.3	14	209.0	1	200.0*	0	-	33	107.1
11-15	32	91.7	28	405.8	1	500.0*	0	-	61	145.2
16-20	31	117.9	34	395.3	2	333.3*	0	-	67	188.7
21-25	21	166.7	41	476.7	1	333.3*	0	-	63	293.0
26-30	5	131.6	45	450.0	0	-	0	-	50	362.3
31+	5	263.2	79	411.5	2	666.7*	0	-	86	401.9
Missing	58	146.5	58	360.2	2	500.0*	1	83.3	119	207.7
Total	183	110.5	315	378.6	9	310.3	1	83.3	508	200.9

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in a specific industry for specific ethnic group

SECTION 7 – MESOTHELIOMA

In comparison with the 19 cases of 1998, there were 24 cases of mesothelioma in 1999. The distribution of mesothelioma by age and ethnic group is presented in Table 7-1.

TABLE 7-1 NUMBER OF MESOTHELIOMA CASES BY AGE & ETHNIC GROUP (1999)

Age Group	Black		White		Coloured		TOTAL	
	N	%	N	%	N	%	N	%
30-39	2	25.0	0	-	0	-	2	8.3
50-59	5	62.5	4	26.7	0	-	9	37.5
60-69	1	12.5	7	46.7	1	100	9	37.5
70-79	0	-	3	20.0	0	-	3	12.5
80-89	0	-	1	6.7	0	-	1	4.2
TOTAL	8		15		1		24	

The distribution of mesothelioma by industry and ethnic group is presented in Table 7-2. Cases are categorized according to the industry in which the most years of service occurred. The highest proportion of mesothelioma cases was found in white miners.

TABLE 7-2 NUMBER OF MESOTHELIOMA CASES BY INDUSTRY & ETHNIC GROUP (1999)

Industry	Black		White		Coloured		TOTAL	
	N	%	N	%	N	%	N	%
Asbestos	5	62.5	2	13.3	1	100	8	33.3
Coal	1	12.5	0	-	0	-	1	4.2
Copper	0	-	1	6.7	0	-	1	4.2
Gold	0	-	3	20.0	0	-	3	12.5
Iscor	0	-	2	13.3	0	-	2	8.3
Platinum	0	-	1	6.7	0	-	1	4.2
Other	2	25.0	3	20.0	0	-	5	20.8
Unknown	0	-	3	20.0	0	-	3	12.5
TOTAL	8		15		1		24	

*2 February 2006. In an earlier print run of this report, the total number of mesothelioma cases was given as 22. Changes have been made to the text and tables.

SECTION 8 – PRIMARY LUNG CANCER

63 cases of primary lung cancer were found at autopsy (84 in 1998) of which 17.5% were in black miners, 76.2% in whites and 6.3% in coloured miners. Most of the cases were of the squamous cell type (27%), followed by lung adenocarcinoma (24%), large cell type (22%), small cell type (21%) and bronchoalveolar carcinoma (6%).

The distribution of primary lung cancer by age and ethnic group is presented in Table 8-1 and Fig 8-1. Black miners were in the age group 40-59 whereas the highest proportion of whites and coloureds were 60-79 years old.

TABLE 8-1 NUMBER AND PREVALENCE OF PRIMARY LUNG CANCER BY AGE & ETHNIC GROUP (1999)

Age group	Black		White		Coloured		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate
40-49	5	7.7	1	12.8	0	-	6	8.2
50-59	5	20.0	3	19.0	0	-	8	19.2
60-69	0	-	23	93.1	3	375.0*	26	93.5
70-79	0	-	15	78.5	1	200.0*	16	78.8
80-89	0	-	5	64.1	0	-	5	61.7
Missing	1	13.2	1	166.7	0	-	2	21.5
TOTAL	11	6.6	48	57.7	4	137.9	63	24.9

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in specific age group for specific ethnic group

The distribution of primary lung cancer by industry and ethnic group is presented in Table 8-2. For black and white miners, the majority of cases came from the gold mining. For coloured miners, most cases were from the asbestos industry where most of the coloured miners were referred from.

TABLE 8-2 NUMBER AND PREVALENCE PRIMARY LUNG CANCER BY INDUSTRY & ETHNIC GROUP (1999)

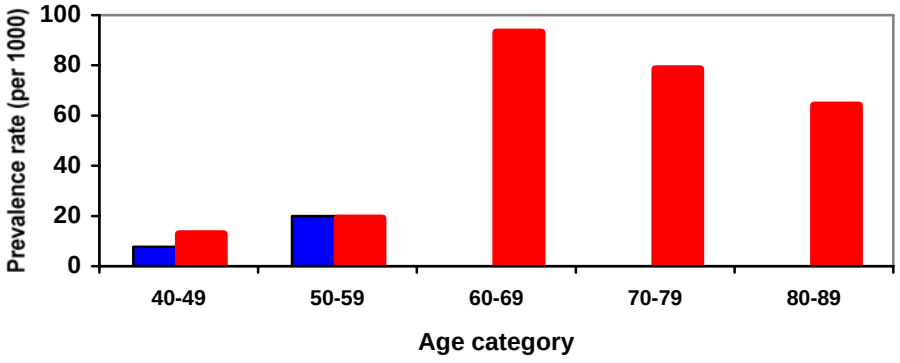
Industry	Black		White		Coloured		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate
Asbestos	1	43.5	2	69.0	4	160.0	7	90.9
Coal	2	24.1	1	17.2	0	-	3	21.3
Copper	0	-	2	200.0*	0	-	2	133.3
Gold	6	4.6	33	54.7	0	-	39	20.3
Iscor	0	-	5	8.3	0	-	5	263.2
Other	1	29.4	2	43.5	0	-	3	37.5
Platinum	1	5.8	1	26.3	0	-	2	9.5
Unknown	0	-	2	83.3	0	-	2	38.5
TOTAL	11	6.6	48	57.7	4	137.9	63	24.9

Rate per 1000; *because of small number of cases in denominator these rates may not be reliable; Denominator: All autopsies in specific industry and ethnic group

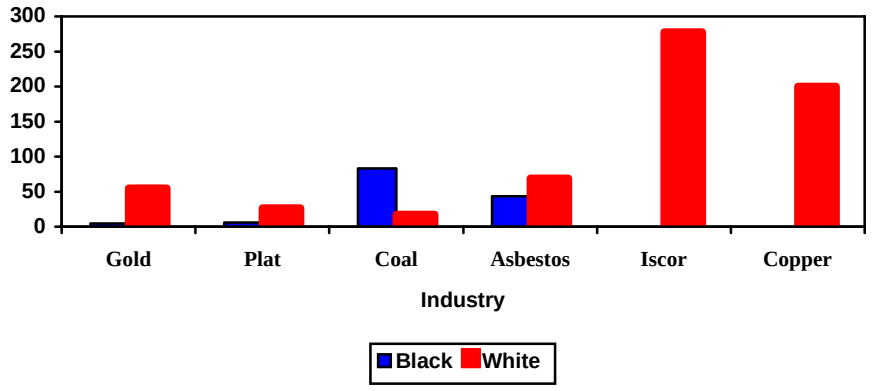
The prevalence of lung cancer by age (a) and industry (b) is shown in Figure 8-2.

FIG 8-2 PREVALENCE (PER 1000) OF LUNG CANCER BY AGE (a) & INDUSTRY (b) FOR BLACK AND WHITE MINERS (1999)

(a)



(b)



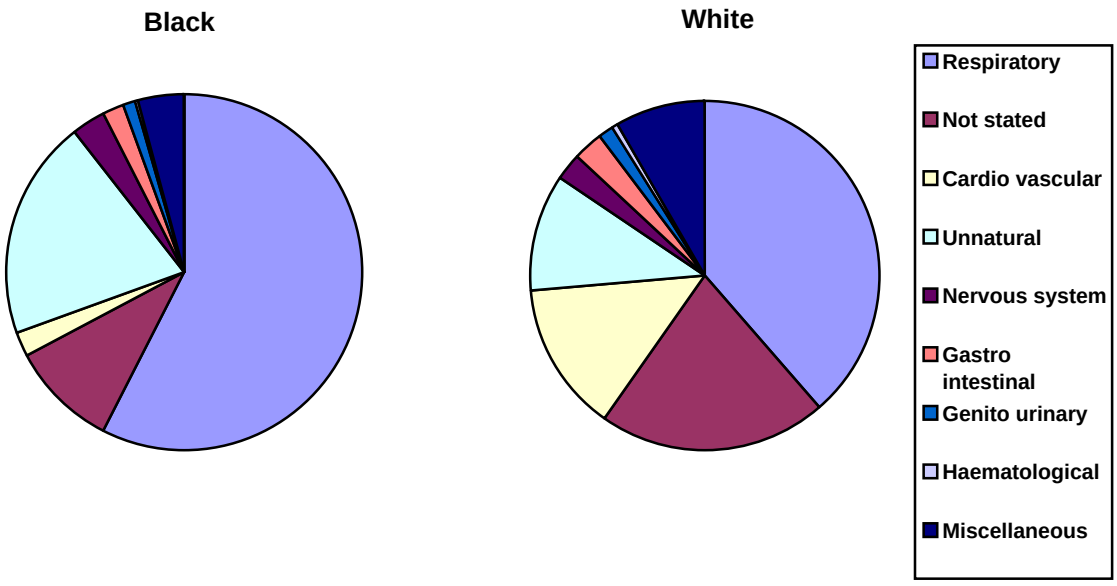
SECTION 9 – CLINICAL CAUSES OF DEATH

Table 9-1 & Figure 9-1 shows the clinical cause of death which accompanied the cardiorespiratory organs by ethnic group. Diseases of the respiratory system were the most frequent (48.4%). Black miners had the highest proportion of unnatural causes of death (20.2%). In 17.4% the cause of death was not stated.

TABLE 9-1 CAUSES OF DEATH BY ETHNIC GROUP (1999)

	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Respiratory	954	57.6	249	29.9	22	75.9	0	-	1225	48.4
Unnatural	335	20.2	87	10.5	2	6.9	1	8.3	425	16.8
Not stated	157	9.5	268	32.2	3	10.3	11	91.7	439	17.4
Cardiovascular	37	2.2	132	15.8	0	-	0	-	169	6.7
Miscellaneous	68	4.1	56	6.7	2	6.9	0	-	126	5.0
Nervous system	50	3.0	9	1.1	0	-	0	-	59	2.3
GI tract	31	1.9	18	2.2	0	-	0	-	49	1.9
Genito urinary	19	1.2	9	1.1	0	-	0	-	28	1.1
Haematological	4	0.2	3	0.4	0	-	0	-	7	0.3
Metabolic	0	-	1	0.1	0	-	0	-	1	0.05
Endocrine system	1	0.06	0	-	0	-	-	-	1	0.05
TOTAL	1656		832		29		12		2529	

FIG 9-1 CAUSE OF DEATH AS GIVEN BY THE CLINICIANS WHO SUBMIT THE ORGANS TO THE NCOH AS SHOWN IN TABLE 9-1



DISTRIBUTION OF AUTOPSIES ACCORDING TO THE LAST MINE THE DECEASED WORKED AT

MINETYPE	LAST MINE WORKED AT	BLACK	WHITE	COLOURED	UNKNOWN	TOTAL
Asbestos	African Chrysotile Asb	4	5	0	0	9
	Asbestos Mine	1	5	0	0	6
	Cape Blue	3	3	5	0	11
	Danielskuil Asb Mine	0	1	3	0	4
	Everite	1	2	0	0	3
	Gefco	3	4	2	0	9
	Kliphuis	0	0	2	0	2
	Koegas	2	1	8	0	11
	Penge Asbestos	2	5	0	0	7
	Pomfret Asb Mine	0	2	0	0	2
	Shabanie Asb Mine	0	1	0	0	1
	Stofbakkies	0	0	1	0	1
	Wandrag Asbestos Mine	0	1	0	0	1
Total from asbestos mines						**66**
Cementation	Cementation	1	1	0	0	2
Total from cementation						**3**
Chrome	Chrome Mine	6	1	0	0	7
	Dilokong chrome Mine	3	0	0	0	3
	Marico Chrome Mine	0	1	0	0	1
	Tweefontein	4	2	0	0	6
	Waterkloof Chrome Mine	0	1	0	0	1
	Winterveld Chrome	0	1	0	0	1
Total from chrome mines						**19**
Coal	Amcoal Colliery	2	2	0	0	4
	Arnot Colliery	3	0	0	0	3
	Bank Colliery	5	2	0	0	7
	Bleskop Colliery	0	1	0	0	1
	Blinkpan Colliery	1	1	0	0	2
	Bosjesspruit Colliery	2	0	0	0	2
	Brandspruit Colliery	8	1	0	0	9
	Delmas Colliery	1	3	0	0	4
	Dorsfontein Colliery	0	1	0	0	1
	Douglas Colliery	1	4	0	0	5
	Duiker Colliery	1	0	0	0	1
	Durban Navigation Coal	0	1	0	0	1
	Durnacol Mine	0	1	0	0	1
	Ermelo Coal	0	1	0	0	1
	Forzando Colliery	1	0	0	0	1
	Goedehoop Colliery	5	0	0	0	5
	Greenside Colliery	0	1	0	0	1
	Grootgeluk	1	0	0	0	1
	Hlobane Colliery	0	5	0	0	5
	Kilbarahan Coal	0	1	0	0	1
	Koornfontein Coal	2	0	0	0	2
	Landau Colliery	2	0	0	0	2
	Longridge Collieries	0	1	0	0	1
	Matla Coal	2	5	0	0	7
	Middelbult Coal Mine	3	1	0	0	4
	Natal Anthracite Coll	0	3	0	0	3

	New Denmark	8	0	0	0	8
	New Largo Colliery	0	3	0	0	3
	Rietspruit Colliery	0	1	0	0	1
	S A Coal Estates	0	1	0	0	1
	Sasol Coal Mine	19	0	0	0	19
	Savemore Colliery	1	0	0	0	1
	Secunda Colliery	7	2	0	0	9
	Shaft sinkers	0	1	0	0	1
	Spingfield Colliery	0	2	0	0	2
	Spitzkop	2	2	0	0	4
	Springbok Colliery	0	1	0	0	1
	Tavistok Colliery	0	1	0	0	1
	Twistdraai	4	1	0	0	5
	Union Coal Mine	0	1	0	0	1
	Van Dyk`s Drift	0	2	0	0	2
	Welgedacht	0	1	0	0	1
	Witbank Collieries	2	6	0	0	8
Total from coal mines						**143**
Copper	Messina Copper Mine	0	2	0	0	2
	O`Kiep Copper	1	3	3	0	7
	Phalaborwa	0	1	0	0	1
	Prieska	0	1	2	0	3
	Shabani Copper Mine	0	1	0	0	1
	Tsumeb Copper Mine	0	1	0	0	1
Total from copper mines						**15**
Diamond	Bellsbank Diamond Mine	4	0	0	0	4
	Cullinan Diamond Mine	3	1	0	0	4
	De Beers Consolidated	3	2	0	0	5
	Diamond Mine	0	1	0	0	1
	Du Plessis Diamond Mine	0	0	1	0	1
	Good Hope Diamond Mine	0	1	0	0	1
	Premier Diamond	3	3	0	0	6
	Sonneberg Diamond Mine	0	1	0	0	1
Total from diamond mines						**23**
Emeralds	Gravelotte	0	1	0	0	**1**
Gold	Barberton GM	0	1	0	0	1
	Beatrix Gold	27	3	0	0	30
	Blyvoorquizicht	1	18	0	0	19
	Bradlock Gold Mine	1	0	0	0	1
	Brakpan Gold Mine	1	1	0	0	2
	Buffelsfontein Gold	13	19	0	0	32
	City Deep	0	2	0	0	2
	Consolidated Main Reef	0	3	0	0	3
	Consolidated Modderfontein	1	1	0	0	2
	Consolidated Murchison	0	1	0	0	1
	Consort GM	2	1	0	0	3
	Crown Mines	0	6	0	0	6
	Daggasfontein	1	5	0	0	6
	Deelkraal	13	2	0	0	15
	Doornfontein	0	9	0	0	9
	Durban Roodepoort Deep	12	17	0	0	29

	East Driefontein	74	15	0	0	89
	East Geduld	1	1	0	0	2
	East Rand Prop	35	15	0	0	50
	Elandsrand	30	8	0	0	38
	Elsburg GM	0	2	0	0	2
	Evander GM	29	2	0	0	31
	Freddies Gold	104	6	0	0	110
	Free State Geduld	4	15	0	0	19
	Free State Saaiplaas	1	5	0	0	6
	Future Gold mining	1	0	0	0	1
	Geldenhuys Gold Mine	0	1	0	0	1
	Grootvlei Prop	2	10	0	0	12
	Harmony	123	21	0	0	144
	Hartebeesfontein	78	22	0	0	100
	J.I.C. Gold Mine	2	0	0	0	2
	Joel	17	2	0	2	21
	Kinross	22	10	0	0	32
	Klipval GM	0	1	0	0	1
	Kloof	57	22	0	0	79
	Leeudoorn	21	5	0	0	26
	Leslie	2	0	0	0	2
	Libanon	39	17	0	0	56
	Loraine	7	6	0	0	13
	Luipaardsvlei Estate	0	1	0	0	1
	Marievale	0	5	0	0	5
	Masimong Gold Mine	10	1	0	0	11
	Modderfontein	0	1	0	0	1
	Murfun Gold Mine	0	1	0	0	1
	Naledi GM	6	0	0	0	6
	New Consort	3	3	0	0	6
	Nigel GM	0	1	0	0	1
	Oryx	18	2	0	0	20
	President Brand	7	16	0	0	23
	President Steyn	72	8	0	0	80
	Primrose GM	0	2	0	0	2
	Rand Leases	0	5	0	0	5
	Randfontein	29	19	0	0	48
	S A Land	0	1	0	0	1
	Saaiplaas GM	0	6	0	0	6
	Sallies	0	2	0	0	2
	Sheba	2	0	0	0	2
	South Roodepoort	0	5	0	0	5
	Springs GM	0	2	0	0	2
	St Helena	34	3	0	0	37
	State GM	0	1	0	0	1
	Stilfontein	3	14	0	0	17
	Sub Nigel	0	1	0	0	1
	Target Gold Mine	1	0	0	0	1
	Unisel GM	0	1	0	0	1
	Vaal Reefs	125	49	0	0	174
	Ventersport	0	5	0	0	5
	Village Main Reef	0	1	0	0	1
	Virginia GM	0	4	0	0	4
	Vlakfontein	0	5	0	0	5

	Vogelstruisbult	0	1	0	0	1
	Welkom GM	2	11	0	0	13
	West Driefontein	54	28	0	0	82
	West Rand Cons	0	6	0	0	6
	West Witwatersrand	4	1	0	0	5
	Western Areas	18	14	0	0	32
	Western Deep Levels	110	37	0	0	147
	Western Holdings	48	13	0	0	61
	Western Reef GM	0	3	0	0	3
	Winkelhaak	3	8	0	0	11
	Wit Nigel GM	0	7	0	0	7
Total from gold mines						**1841**
Platinum	Amadelbult Platinum (Rustenburg)	10	0	0	0	10
	Atok Platinum	5	0	0	0	5
	Bafokeng	1	0	0	0	1
	Eastern Platinum Mine	4	0	0	0	4
	Impala Platinum	4	23	0	0	27
	Karee Platinum	1	1	0	0	2
	Northam Platinum	5	2	0	0	7
	Rustenburg Platinum	158	25	0	0	183
	Swartklip Platinum	3	0	0	0	3
	Western Platinum	2	3	0	0	5
	Wildebeestfontein	1	0	0	0	1
	Zondereinde Plat Mine	2	1	0	0	3
Total from platinum mines						**251**
Iron	Sishen Iron Mine	1	1	0	0	**2**
Iron & Mangenese	Associated Manganese	4	2	1	0	**7**
Lead & Minerals	Blackmountain	0	1	0	0	**1**
Lime	Union Lime	1	0	0	0	**1**
Manganese	S A Manganese	2	1	0	0	**3**
Minerals	African Rainbow Minerals & Expl	22	0	0	0	**22**
Non Miner	Industry	1	1	0	0	**2**
	Non Miner	2	9	0	0	**11**
Phosphate	Foskor Beperk	1	1	0	0	**2**
Quarry	Quarry	1	0	0	0	**1**
Silica	Silicon Smelters	4	0	0	0	**4**
Steel	Highveld Steel and Vanadium	1	4	0	0	**5**
Steel & Iron	Iscor	1	40	1	0	**42**
Tin	Rooiberg Mineral Division	0	2	0	0	**2**
	Transvaal Tin	0	1	0	0	**1**
	Tin mine	0	1	0	0	**1**
	Union Tin	0	1	0	0	**1**
Unknown	Unknown	21	26	0	10	**57**
Zinc	Maranda Mine	0	1	0	0	**1**
TOTAL		**1656**	**832**	**29**	**12**	**2529**