



DEPARTMENT OF HEALTH  
*Republic of South Africa*

# DEPARTMENT OF HEALTH

**Pathology Division  
Report:  
Demographic Data and  
Disease Rates for  
January - December  
2000**

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OCCUPATIONAL HEALTH**

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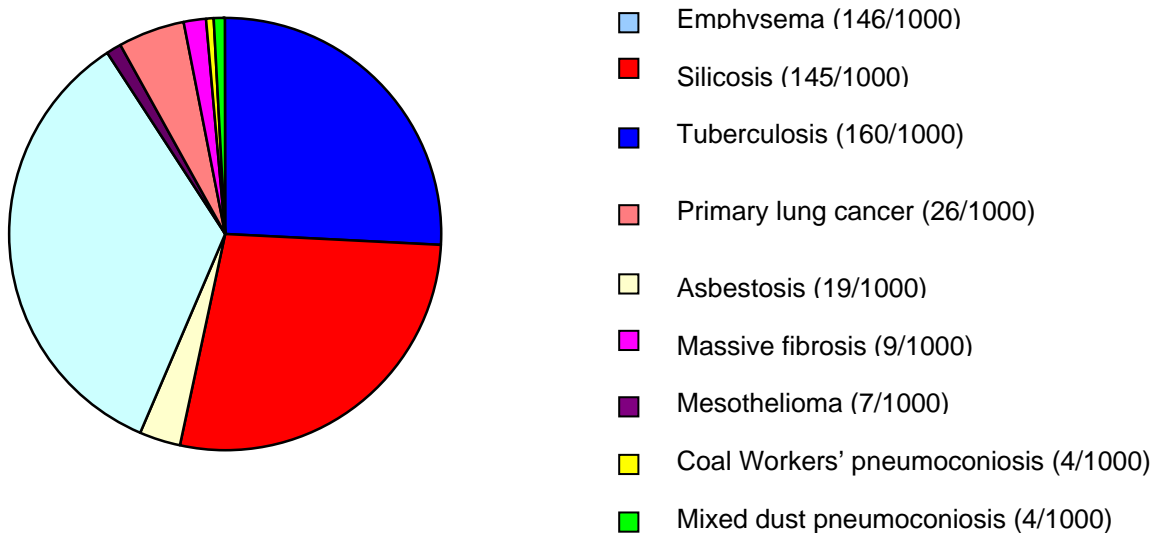
## EXECUTIVE SUMMARY

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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 is unique and provides an important resource for surveillance and research.

During 2000, 2608 cases came to autopsy at the NCOH. Of these, 68.9% were black men, 29.2% whites, 1.6% coloureds and 0.3% were submitted without information on the ethnic group. No Asians (Indians) were autopsied.

Overall disease rates (per 1000 cases) for 2000 are as follows:



## SECTION 1 – INTRODUCTION

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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 submit 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 fourth of the new format reports and describes autopsy cases examined during the year 2000.

Data from PATHAUT are exported into the Statistical Analysis System (SAS System) where programs have been written using the Structured Query Language (SQL) which allows the user to analyze data on the SAS System on any aspect of the PATHAUT database.

## SECTION 2 – DATA DESCRIPTION

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

**TABLE 2-1 DISTRIBUTION OF AUTOPSIES BY YEAR & ETHNIC GROUP  
(1975-2000)**

Year of autopsy	Black		White		Coloured		Indian		Unknown		Total 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
2000	1798	69	761	29	41	2			8	0.3	2608
<b>TOTAL</b>	<b>55 450</b>	<b>66</b>	<b>26 704</b>	<b>32</b>	<b>1 340</b>	<b>2</b>	<b>1</b>	<b>0.001</b>	<b>69</b>	<b>0.1</b>	<b>83 564</b>

\* Data for only ± 6 months are available for this year

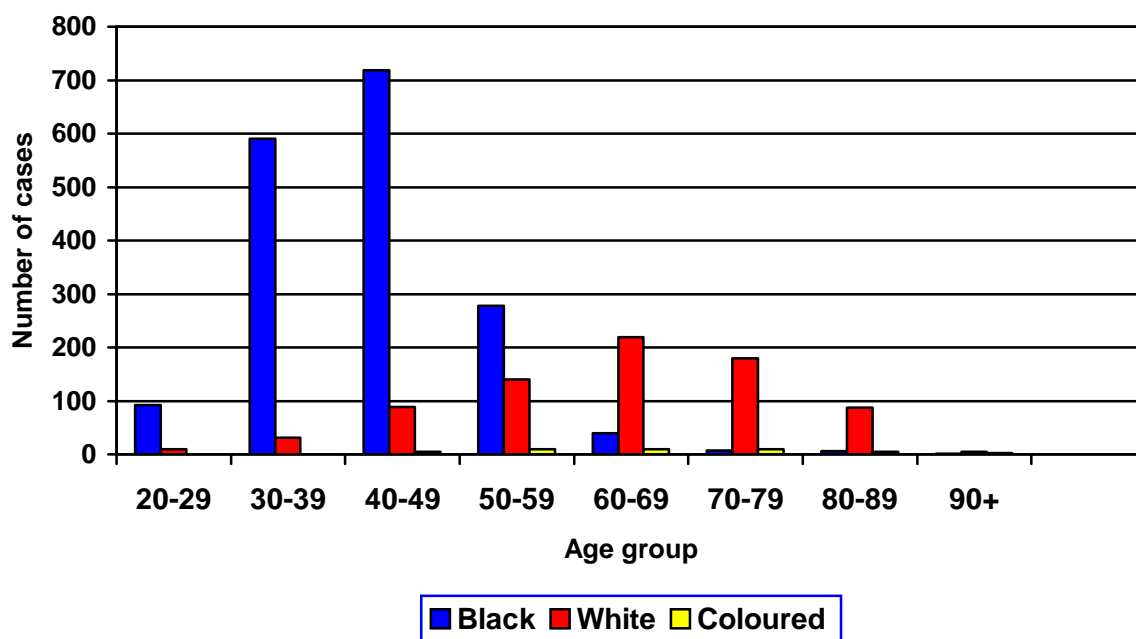
It is important to note that there is a referral bias in that black men are infrequently autopsied after leaving employment in the mines, whereas the majority of whites come to autopsy after retirement.

The age distribution of autopsies for 2000 is shown in Table 2-2 and Fig 2-1. The mean age for autopsy from black miners has increased from 37.9 years in 1998, 40.1 years in 1999 to 40.8 years in 2000. The age of white miner autopsies has also increased to 63.3 years in 2000 compared to 61.8 years in 1999.

**TABLE 2-2 NUMBERS OF AUTOPSIES BY AGE & ETHNIC GROUP (2000)**

Age group	Black		White		Coloured		Unknown		All races	
	N	%	N	%	N	%	N	%	N	%
20-29	92	5.1	9	1.1	0	0.0	0	0.0	101	3.9
30-39	591	32.9	31	4.1	1	2.4	0	0.0	623	23.9
40-49	719	40.0	89	11.7	5	12.2	0	0.0	813	31.2
50-59	278	15.5	140	18.4	9	22.0	0	0.0	427	16.4
60-69	40	2.2	219	28.8	10	24.4	0	0.0	269	10.3
70-79	7	0.4	180	23.7	9	22.0	0	0.0	196	7.5
80-89	6	0.3	87	11.4	5	2.0	0	0.0	98	3.8
90+	1	0.1	5	0.7	2	4.9	0	0.0	8	0.3
Unknown	64	3.6	1	0.1	0	0.0	8	100.0	73	2.8
<b>Total</b>	1798	100	761	100	41	100	8	100	2608	100

**FIG 2-1 DISTRIBUTION OF AUTOPSIES BY AGE & ETHNIC GROUP(2000)**



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 2000. Autopsies of only the cardio-respiratory organs comprised 93.9% of examinations.

**TABLE 2-3 NUMBER OF AUTOPSIES BY TYPE & ETHNIC GROUP (2000)**

	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
<b>Cardiorespiratory organs only</b>	1792	99.7	609	80.0	41	100	8	100	2450	93.9
<b>Full autopsy</b>	6	0.3	152	20.0	0	0	0	0	158	6.1
<b>TOTAL</b>	1798	100	761	100	41	100	8	100	2608	100

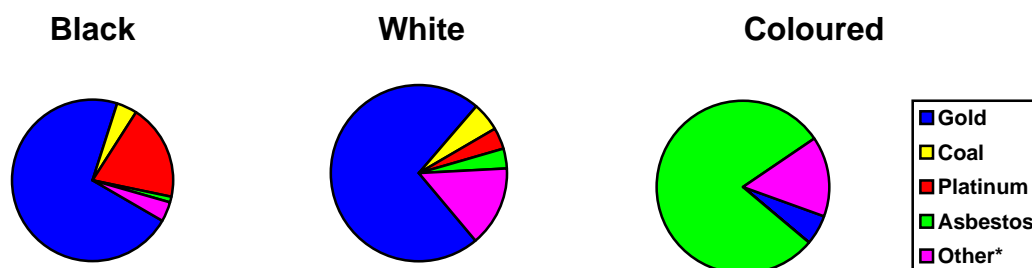
Table 2-4 and Figure 2-4 show the distribution of autopsies by industry and ethnic group for 2000. The majority of miners were from the gold mining industry (70.7%) compared to 75.8% in 1999. The number of autopsies from platinum miners has increased from 173 (10.4% of autopsies of blacks) in 1999 to 343 (19.1%) in 2000. As in 1999 the majority of autopsies from coloured miners came from asbestos mines (68.3%).

**TABLE 2-4 NUMBER OF AUTOPSIES BY INDUSTRY & ETHNIC GROUP (2000)**

	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Gold	1289	71.7	551	72.6	2	4.9	0	0.0	1842	70.7
Coal	75	4.2	39	5.1	0	0.0	0	0.0	114	4.4
Platinum	343	19.1	30	4.0	0	0.0	0	0.0	373	14.3
Asbestos	19	1.1	28	3.7	28	68.3	0	0.0	75	2.9
Diamond	16	0.9	13	1.7	1	2.4	0	0.0	30	1.2
Copper	5	0.3	17	2.2	8	19.5	0	0.0	30	1.2
Isacor	1	0.1	15	2.0	0	0.0	0	0.0	16	0.6
Other	19	1.1	35	4.6	1	2.4	0	0.0	55	2.1
Unknown	31	1.7	31	4.1	1	2.4	8	100.0	71	2.7
<b>Total</b>	1798	100	759	100	41	100	8	100	2606	100



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



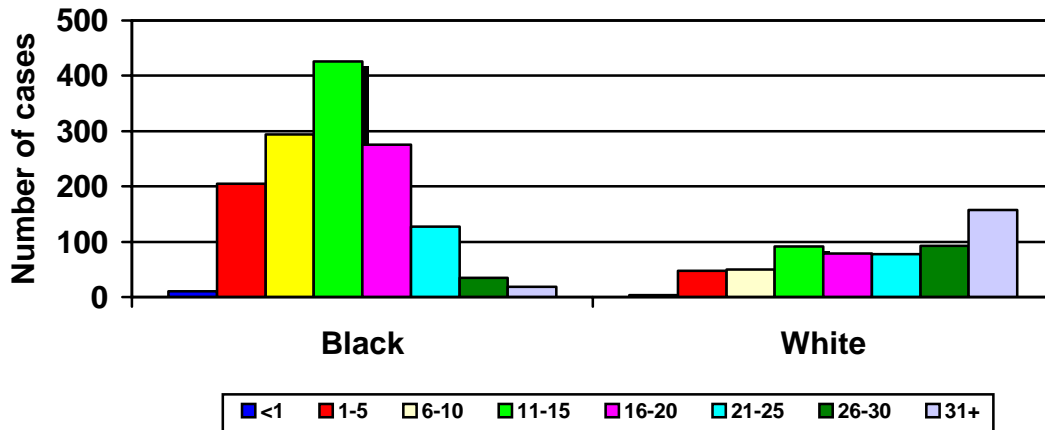
\* Includes copper, diamond, quarry, silica (silicon smelters), manganese, tin, zinc, minerals, chrome and iron as well as cases where information about type of mining is missing

Detailed information duration of 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. It is important to note the large percentage of cases with missing information on the duration of service (22.6%), which is a reflection of the poor quality of the data provided by the mines. This is similar to 1999 (22.7%) but lower than the figure for 1998 (43%).

**TABLE 2-5 NUMBER OF AUTOPSIES BY YEARS OF SERVICE & ETHNIC GROUP (2000)**

	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
<1	10	0.6	3	0.4	0	0.0	0	0.0	13	0.5
1-5	205	11.4	47	6.2	4	9.8	0	0.0	256	9.8
6-10	294	16.4	50	6.6	10	24.4	0	0.0	354	13.6
11-15	426	23.7	92	12.1	2	4.9	0	0.0	520	19.9
16-20	275	15.3	79	10.4	5	12.2	0	0.0	359	13.8
21-25	127	7.1	78	10.3	1	2.4	0	0.0	206	7.9
26-30	35	2.0	93	12.2	2	4.9	0	0.0	130	5.0
31+	18	1.0	157	20.6	5	12.2	0	0.0	180	6.9
Missing	408	22.7	162	21.3	12	29.3	8	100	590	22.6
<b>Total</b>	<b>1798</b>	<b>100</b>	<b>761</b>	<b>100</b>	<b>41</b>	<b>100</b>	<b>8</b>	<b>100</b>	<b>2608</b>	<b>100</b>

**FIG 2-5 DISTRIBUTION OF AUTOPSIES BY YEARS OF SERVICE & ETHNIC GROUP (2000)**



The mean duration of service & age by mining type and ethnic group is shown in Table 2-6. Cases where age and type of mine service were not given are excluded.

**TABLE 2-6: MEAN DURATION OF SERVICE AND MEAN AGE BY MINE TYPE & ETHNIC GROUP (2000)**

Minetype	Black					White				
	N	Age		Service		N	Age		Service	
		Mean	SD	Mean	SD		Mean	SD	Mean	SD
Gold	1085	42	8	13	7	463	65	14	24	11
Coal	55	41	9	15	8	31	58	15	16	12
Platinum	199	43	8	12	7	24	59	15	18	11
Asbestos	14	62	11	12	9	18	59	11	14	9
Diamond	9	49	8	15	10	8	62	11	22	8
Copper	5	53	7	16	5	14	67	12	16	8
Iscor	1	47	-	24	-	14	61	11	22	13
Other	14	50	8	14	8	24	64	10	20	10
<b>Total</b>	1382					596				

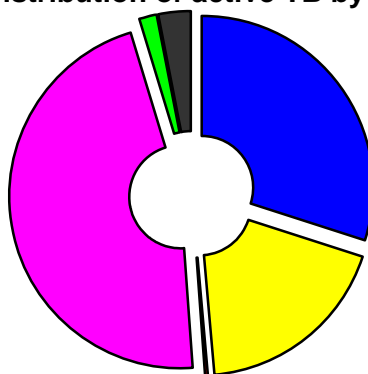
## SECTION 3 – ACTIVE TUBERCULOSIS

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Active tuberculosis was diagnosed in 16.4% (416) of all the cases autopsied in 2000<sup>1</sup>, in comparison with the 387 (15%) cases of the previous year. The distribution of tuberculosis (TB) by anatomical site is presented in Fig 3-1. 81% of TB cases had active pulmonary tuberculosis (PTB). Of the PTB cases, 81.3% involved the lungs extensively. 94.0% (391 cases) of PTB cases were black, 4.3% (18 cases) white, 1.2% (5 cases) coloured miners and in 0.5% (2 cases) the ethnic group was unknown. 80% of all TB cases came from the gold mines and most (43%) of the PTB cases were in the age group 40-49.

The overall rate of TB (159/1000) is higher than in previous years: 123/1000 (1999) and 149/1000 (1998). This is attributed to the increase in the PTB rate in black miners from 206/1000 in 1998; 174 (1999) to 218/1000 in 2000. The rate in PTB has increased markedly in the platinum miners.

**Fig 3-1 Distribution of active TB by site (2000)**



■ Glands & lungs (46.5%)	■ Glands, pericardium & lungs (3.1%)
■ Lungs only (30.1)	■ Pericardium & lungs (1.6%)
■ Glands only (18.6%)	■ Pericardium only (0.2%)

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<sup>1</sup> earlier printings of this report incorrectly gave the figure for 1999.

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).

**TABLE 3-1 NUMBER & PREVALENCE OF ACTIVE PTB BY AGE & ETHNIC GROUP (2000)**

Age group	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	17	185	0	0	0	-	0	-	16	158
30-39	123	208	1	32	0	0	0	-	124	197
40-49	171	238	6	67	2	400	0	-	179	220
50-59	56	201	4	29	2	222	0	-	62	145
60-69	7	175	3	10	0	0	0	-	10	37
70-79	0	0	2	11	1	111	0	-	3	15
80-89	2	333	2	23	0	0	0	-	4	40
Missing	15	234	0	0	0	-	2	250	17	233
<b>TOTAL</b>	<b>391</b>	<b>218</b>	<b>18</b>	<b>22</b>	<b>5</b>	<b>122</b>	<b>2</b>	<b>250</b>	<b>416</b>	<b>159</b>

Rate per 1000. Denominator: All autopsies in specific age group for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

The distribution of active PTB cases by industry is shown in Table 3-2.

**TABLE 3-2 NUMBER & PREVALENCE OF ACTIVE PTB BY INDUSTRY & ETHNIC GROUP (2000)**

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	282	218.8	8	15	0	0	0	0	290	157
Coal	10	139	0	0	0	0	0	0	10	88
Platinum	86	251	0	0	0	0	0	0	86	231
Asbestos	1	53	2	71	3	107	0	0	6	80
Diamond	4	250	0	0	0	0	0	0	4	133
Other	2	105	7	200	2	222	0	0	11	200
Unknown	6	194	1	32	0	0	2	250	9	127
<b>TOTAL</b>	<b>391</b>	<b>218</b>	<b>18</b>	<b>25</b>	<b>5</b>	<b>122</b>	<b>2</b>	<b>250</b>	<b>416</b>	<b>163</b>

Rate per 1000. Denominator: All autopsies in a specific industry for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

**TABLE 3-3 NUMBER OF ACTIVE PTB BY YEARS OF SERVICE & ETHNIC GROUP (2000)**

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
<1	1	100	0	0	0	-	0	0	1	77
1-5	41	200	1	21	1	250	0	0	43	168
6-10	56	191	4	80	0	0	0	0	60	170
11-15	94	221	1	11	0	0	0	0	95	183
16-20	58	211	2	25	1	200	0	0	61	170
21-25	34	268	2	26	1	1000	0	0	37	18
26-30	4	114	2	22	0	0	0	0	6	46
31+	0	0	3	19	1	200	0	0	4	22
Missing	103	253	3	19	1	83.3	2	250	109	185
<b>Total</b>	<b>391</b>	<b>218</b>	<b>18</b>	<b>24</b>	<b>5</b>	<b>122</b>	<b>2</b>	<b>250</b>	<b>416</b>	<b>160</b>

Rate per 1000. Denominator: All autopsies in a specific industry for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

## SECTION 4 – SILICOSIS

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Silicotic nodules were found in the lungs in 378 cases (14.5% of all autopsies). 92.9% of these cases came from the gold mining industry. Of all cases of silicosis, occasional silicotic nodules were found in 66.7%, a few in 21.2%, a moderate number in 10.6% and a large number in 1.5%.

The age distribution of cases with silicosis (Table 4-1) differed between ethnic groups. No clear trend was evident for increasing age and increasing rates of silicosis in black miners. One explanation is that relatively few older black miners who have retired came to autopsy.

**TABLE 4-1 NUMBER & PREVALENCE OF SILICOSIS BY AGE & ETHNIC GROUP (2000)**

Age group	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
30-39	39	66	0	0	0	0	0	0	39	62
40-49	124	172	0	0	0	0	0	0	127	156
50-59	71	255	3	34	0	0	0	0	85	199
60-69	13	325	14	100	0	0	0	0	49	182
70-79	1	143	36	124	0	0	0	0	36	184
80-89	2	333	35	194	0	0	0	0	26	265
Missing	16	250	24	276	0	0	0	0	16	219
<b>TOTAL</b>	<b>266</b>	<b>148</b>	<b>112</b>	<b>134</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>378</b>	<b>145</b>

Rate per 1000. Denominator: All autopsies in specific age group for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

The distribution of cases with silicosis by industry and ethnic group is presented in Table 4-2. 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 4-2 NUMBER & PREVALENCE OF SILICOSIS BY INDUSTRY & ETHNIC GROUP (2000)**

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	250	194	101	183	0	0	0	0	351	191
Platinum	7	20	3	100	0	0	0	0	10	27
Coal	3	40	2	51	0	0	0	0	5	44
Asbestos	1	53	0	0	0	0	0	0	1	13
Diamond	0	0	0	0	0	0	0	0	0	0
Iscor	0	0	0	0	0	0	0	0	0	0
Other	2	83	4	77	0	0	0	0	6	71
Unknown	3	97	2	65	0	0	0	0	5	70
<b>TOTAL</b>	<b>266</b>	<b>148</b>	<b>112</b>	<b>148</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>378</b>	<b>1451</b>

Rate per 1000. Denominator: All autopsies in a specific industry and ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

**TABLE 4-3 NUMBER AND PREVALENCE OF SILICOSIS BY YEARS OF SERVICE & ETHNIC GROUP (2000)**

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
<1	1	100	0	0	0	-	0	-	1	77
1-5	16	78	1	21	0	0	0	-	17	66
6-10	23	78	2	40	0	0	0	-	25	71
11-15	65	153	7	76	0	0	0	-	72	138
16-20	61	222	7	89	0	0	0	-	68	189
21-25	41	323	12	154	0	0	0	-	53	257
26-30	12	343	27	290	0	0	0	-	39	300
31+	7	389	40	255	0	0	0	-	47	261
Missing	40	98	16	99	0	0	0	0	56	95
<b>Total</b>	<b>266</b>	<b>148</b>	<b>112</b>	<b>147</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>378</b>	<b>145</b>

Rate per 1000. Denominator: All autopsies in a specific industry for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

## **SECTION 5 – MASSIVE FIBROSIS, COALWORKER’S PNEUMOCONIOSIS, MIXED DUST FIBROSIS & ASBESTOSIS**

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### **MASSIVE FIBROSIS**

There were 15 (0.6%) cases of massive fibrosis (8 black, 7 white) and all were from the gold mining industry and 14 were miners with less than 11 years experience.

### **COAL WORKERS’ PNEUMOCONIOSIS**

There were 9 cases of coal workers’ pneumoconiosis with 6/9 in the age group 40-49, younger than those reported in the 1999 survey.

### **MIXED DUST FIBROSIS**

There were 7 (0.3%) cases of mixed dust fibrosis of whom 5/7 came from the gold mining industry.

### **ASBESTOSIS**

There were 50 (2.8%) cases of asbestosis of which 66% (n=33) had slight interstitial fibrosis, 28% moderate and 3% marked. Amongst all cases with a history of asbestos exposure, there were only 8 in whom were asbestos plaques 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 (2000)**

Age group	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
40-49	7	10	2	23	0	0	9	11
50-59	6	22	4	29	2	222	12	28
60-69	3	75	9	41	4	400	16	60
70-79	2	286	4	22	2	222	8	41
80-89	2	333	0	0	3	600	5	51
TOTAL	20	11	19	25	11	268	50	19

Rate per 1000. All autopsies in specific age group for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

## SECTION 6 – EMPHYSEMA

There were 429 cases of emphysema, the extent of which was mild in 62.0%, moderate in 32.6% and marked in 5.4%. 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 (2000)**

Age group	Black		White		Coloured		Unknown		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	1	11	0	-	0	-	0	-	1	11
30-39	16	27	1	32	0	-	0	-	17	27
40-49	61	85	11	124	0	-	0	-	72	89
50-59	49	176	43	307	2	222	0	-	94	220
60-69	12	300	84	384	5	500	0	-	101	376
70-79	2	286	85	472	6	667	0	-	93	475
80-89	3	500	35	402	4	800	0	-	42	429
90+	1	1000	0	-	1	500	0	-	1	125
Missing	8	125	0	-	0	-	0	-	8	123
<b>TOTAL</b>	<b>152</b>	<b>85</b>	<b>259</b>	<b>340</b>	<b>18</b>	<b>439</b>	<b>0</b>	<b>-</b>	<b>429</b>	<b>165</b>

Rate per 1000. Denominator: All autopsies in specific age group for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

For black and white miners with emphysema, the majority were from the gold mining industry (71.7%) (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 (2000)**

Industry	Black		White		Coloured		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	111	87	196	355.7	0	0.0	307	166.7
Platinum	14	41	7	233.3	0	-	21	56.3
Coal	13	173	10	256.4	0	-	23	201.8
Asbestos	4	211	7	250.0	15	535.7	26	346.7
Iscor	0	0	6	400.0	0	-	6	375.0
Copper	1	200	6	352.9	3	375.0	10	333.3
Diamond	1	63	6	461.5	0	0.0	7	233.3
Other	4	211	10	285.7	0	0.0	14	254.5
Unknown	4	129	10	322.6	0	0.0	14	197.2
<b>TOTAL</b>	<b>152</b>	<b>85</b>	<b>258</b>	<b>339.9</b>	<b>18</b>	<b>439.0</b>	<b>428</b>	<b>164.2</b>

Rate per 1000. Denominator: All autopsies in a specific industry and ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

**TABLE 6-3 NUMBER OF EMPHYSEMA BY YEARS OF SERVICE & ETHNIC GROUP (2000)**

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
<1	0	0.0	0	0.0	0	-	0	-	0	0
1-5	11	54	9	192	0	0	0	-	20	78
6-10	16	54	16	320	6	600	0	-	38	107
11-15	31	73	33	359	1	500	0	-	65	125
16-20	35	127	27	342	3	600	0	-	65	181
21-25	15	118	25	321	0	0	0	-	40	194
26-30	5	143	28	301	0	0	0	-	33	254
31+	3	167	67	427	3	600	0	-	73	406
Missing	36	88	54	333	5	417	0	0	95	161
<b>TOTAL</b>	<b>152</b>	<b>85</b>	<b>259</b>	<b>340</b>	<b>18</b>	<b>439</b>	<b>0</b>	<b>0</b>	<b>429</b>	<b>165</b>

Rate per 1000. Denominator: All autopsies in a specific industry for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

## SECTION 7 – MESOTHELIOMA

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The number of cases of mesothelioma in 2000 was 17 compared to 24 in 1999 and 19 in 1998. The majority of cases were whites (n=15; 88.2%) (Table 7-1).

**TABLE 7-1 NUMBER OF MESOTHELIOMA CASES BY AGE & ETHNIC GROUP (2000)**

Age Group	Black		White		Coloured		TOTAL	
	N	%	N	%	N	%	N	%
30-39	1	100	0	0	0	0	1	6
40-49	0	0	0	0	1	100	1	6
50-59	0	0	6	40	0	0	6	35
60-69	0	0	7	47	0	0	7	41
70-79	0	0	1	7	0	0	1	6
80-89	0	0	1	7	0	0	1	6
<b>TOTAL</b>	<b>1</b>		<b>15</b>		<b>1</b>		<b>17</b>	

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.

**TABLE 7-2 NUMBER OF MESOTHELIOMA CASES BY INDUSTRY & ETHNIC GROUP (2000)**

Industry	Black		White		Coloured		TOTAL	
	N	%	N	%	N	%	N	%
Asbestos	0	0	6	40	0	0	6	35
Coal	0	0	1	7	0	0	1	6
Copper	0	0	0	0	1	100	1	6
Gold	1	100	4	27	0	0	5	29
Other	0	0	1	7	0	0	1	6
Unknown	0	0	3	20	0	0	3	18
<b>TOTAL</b>	<b>1</b>		<b>15</b>		<b>1</b>		<b>17</b>	

\*2 February 2006. In an earlier print run of this report, the total number of mesothelioma cases was given as 14. Changes have been made to the text and tables.

## SECTION 8 – PRIMARY LUNG CANCER

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69 cases of primary lung cancer were found at autopsy of which 18.8% were in black miners, 73.9% in whites and 7.3% in coloured miners. Most of the cases were of the squamous cell type (28%), followed by large cell type (23%), adenocarcinoma (22%), small cell type (22%), 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 40-49 whereas the highest proportion of whites were 60-69 years old.

**TABLE 8-1 NUMBER AND PREVALENCE OF PRIMARY LUNG CANCER BY AGE & ETHNIC GROUP (2000)**

Age group	Black		White		Coloured		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate
40-49	7	10	1	11	0	0	8	10
50-59	2	7	6	43	1	111	9	21
60-69	2	50	27	93	2	200	31	115
70-79	1	43	10	56	1	111	12	61
80-89	0	0	7	81	1	200	8	82
Missing	1	16	0	0	0	-	1	14
<b>TOTAL</b>	<b>13</b>	<b>7</b>	<b>51</b>	<b>7</b>	<b>5</b>	<b>122</b>	<b>69</b>	<b>26</b>

Rate per 1000. Denominator: all autopsies in specific age group for specific ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

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, which referred the majority of autopsies of coloured miners (68.3%; Table 2.4).

**TABLE 8-2 NUMBER AND PREVALENCE PRIMARY LUNG CANCER BY INDUSTRY & ETHNIC GROUP (2000)**

Industry	Black		White		Coloured		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	5	4	38	69	0	0	43	23
Coal	1	13	1	26	0	-	2	18
Asbestos	0	0	3	107	4	142.9	7	93
Platinum	3	9	1	33	0	-	4	11
Copper	0	0	1	59	1	125	2	67
Diamond	1	63	0	0	0	0	1	33
Iscor	0	0	1	67	0	-	1	63
Other	1	53	5	143	0	0	6	109
Unknown	2	65	1	32	0	0	3	42
<b>TOTAL</b>	<b>13</b>	<b>7</b>	<b>51</b>	<b>67</b>	<b>5</b>	<b>122</b>	<b>69</b>	<b>27</b>

Rate per 1000. Denominator: all autopsies in specific industry and ethnic group. Where there are a small number of cases in the denominator these rates may not be reliable.

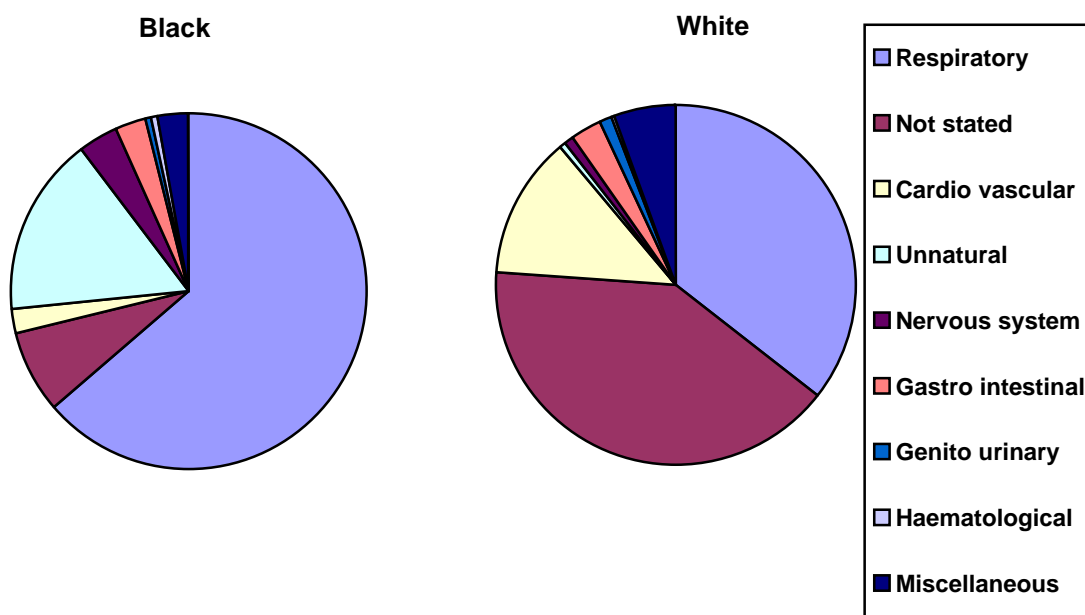
## SECTION 9 – CLINICAL CAUSES OF DEATH

Table 9-1 & Figure 9-1 shows the clinical cause of death submitted by the doctors, which accompanied the cardiorespiratory organs by ethnic group. Diseases of the respiratory system were the most frequent (54.7%) which has increased from 50.9% (1998) to 57.6% (1999) to 63.5% (2000) in black miners. Black miners had the highest proportion of unnatural causes of death (16.5%). In 16.9% the cause of death was not stated.

**TABLE 9-1 CLINICAL CAUSES OF DEATH BY ETHNIC GROUP (2000)**

	Black		White		Coloured		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Respiratory	1141	64.5	254	33.4	29	70.7	1	12.5	1425	54.7
Unnatural	297	16.5	48	6.3	2	4.9	0	0.0	347	13.3
Not stated	137	7.6	291	38.2	6	14.6	7	87.5	441	16.9
Cardiovascular	38	2.1	92	12.1	3	7.3	0	0.0	133	5.1
Miscellaneous	47	2.6	40	5.3	0	0.0	0	0.0	87	3.3
Nervous system	64	3.6	5	0.7	1	2.4	0	0.0	70	2.7
GI tract	48	2.7	21	2.8	0	0.0	0	0.0	69	2.7
Genito urinary	12	0.7	8	1.1	0	0.0	0	0.0	20	0.8
Haematological	11	0.6	1	0.1	0	0.0	0	0.0	12	0.5
Metabolic	2	0.1	1	0.1	0	0.0	0	0.0	3	0.1
<b>TOTAL</b>	<b>1797</b>	<b>100.0</b>	<b>761</b>	<b>100.1</b>	<b>41</b>	<b>99.9</b>	<b>8</b>	<b>100.0</b>	<b>2607</b>	<b>100.1</b>

**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 WHERE THE DECEASED WORKED

MINETYPE	LAST MINE WORKED AT	BLACK	WHITE	COLOURED	UN-KNOWN	TOTAL
<b>Asbestos</b>	African Chrysotile Asbestos	0	1	0	0	1
	Asbestos Mine	3	2	0	0	5
	Aucampsrus Asbestos Mine	0	0	1	0	1
	Cape Blue	1	2	4	0	7
	Danielskuil Asb Mine	0	2	1	0	3
	Dublin Asbestos Mine	0	1	0	0	1
	Elandsfontein Asbestos Mine	0	0	1	0	1
	Enkellewiller Asbestos Mine	0	0	1	0	1
	Everite	0	2	0	0	2
	Gefco	8	0	3	0	11
	Glen Allen Asbestos Mine	0	0	1	0	1
	Kliphuis	0	1	2	0	3
	Koegas	3	3	9	0	15
	Noupoort Asbestos Mine	0	0	2	0	2
	Penge Asbestos	1	4	0	0	5
	Pomfret Asb Mine	2	1	0	0	3
	Stella Asbestos Mine	0	1	0	0	1
	<b>Total from asbestos mines</b>					
<b>Cementation</b>	Cementation	0	2	0	0	2
	Ulco Cement	1	0	0	0	1
<b>Chrome</b>	Chrome Mine	0	1	0	0	1
	Montrose Chrome Mine	2	2	0	0	4
	Rustenburg Chrome	0	1	0	0	1
	Swartkop Chrome	0	1	0	0	1
	Tweefontein	0	1	0	0	1
	Western Chrome Mine	0	1	0	0	1
	Winterveld Chrome	0	1	0	0	1
<b>Total from chrome mines</b>						<b>10</b>
<b>Coal</b>	Alpha Anthracite Colliery	0	1	0	0	1
	Arnot Colliery	2	0	0	0	2
	Bank Colliery	5	2	0	0	7
	Black Wattle Colliery	0	1	0	0	1
	Blesbok Colliery	0	1	0	0	1
	Blinkpan Colliery	0	2	0	0	2
	Bosjesspruit Colliery	4	1	0	0	5
	Brandspruit Colliery	3	1	0	0	4
	Delmas Colliery	0	2	0	0	2
	Dorstfontein colliery	1	0	0	0	1
	Douglas Colliery	0	1	0	0	1
	Driehoek Collieries	0	1	0	0	1
	Duiker Colliery	2	0	0	0	2
	Durban Navigation Colliery	1	0	0	0	1
	Goedehoop Colliery	7	2	0	0	9
	Greenside Colliery	2	2	0	0	4
	Grootgeluk	1	0	0	0	1
	Khutala Colliery	1	0	0	0	1
	Kleinkopje Colliery	1	0	0	0	1
	Kriel Colliery	6	0	0	0	6
	Landau Colliery	1	0	0	0	1
	Matla Coal	4	3	0	0	7
	New Denmark	1	3	0	0	4
New Vaal Colliery	1	0	0	0	1	



	Newcastle Coal Mine	0	2	0	0	2
	Richardsbay Coal Mine	0	1	0	0	1
	Rietspruit Colliery	0	1	0	0	1
	S A Coal Estates	1	2	0	0	3
	Sasol Coal Mine	11	4	0	0	15
	Savemore Colliery	6	0	0	0	6
	Secunda Colliery	11	0	0	0	11
	Sigma Colliery	0	3	0	0	3
	Spingfield Colliery	1	2	0	0	3
	Strathrae Collieries	1	1	0	0	2
	Tavistok Colliery	1	1	0	0	2
	Transvaal Navigation Colliery	0	1	0	0	1
	Twistdraai	3	1	0	0	4
	Usutu Colliery	0	1	0	0	1
	Van Dyk`s Drift	0	1	0	0	1
	Vlaklaagte coal mine	0	1	0	0	1
	Vryheid Coronation	0	2	0	0	2
	Welgedacht	0	1	0	0	1
	Witbank Collieries	1	1	0	0	2
<b>Total from coal mines</b>						<b>128</b>
<b>Copper</b>	Bamangwato Copper Mine	1	0	0	0	1
	Copper Mine	0	0	1	0	1
	Messina Copper Mine	0	1	0	0	1
	O`Kiep Copper	0	6	6	0	12
	Phalaborwa	4	2	0	0	6
	Prieska	0	3	2	0	5
	Tsumeb Copper Mine	0	2	0	0	2
<b>Total from copper mines</b>						<b>28</b>
<b>Diamond</b>	Bellsbank Diamond Mine	2	1	0	0	3
	Bobbejaan Diamond Mine	0	1	0	0	1
	Cullinan Diamond Mine	1	2	0	0	3
	Dancarl Diamond Mine	2	0	0	0	2
	Diamond Mine	2	0	0	0	2
	Loraine	2	3	0	0	5
	Messina Diamond Mine	1	0	0	0	1
	Premier Diamond	7	6	1	0	14
	Sonneberg Diamond Mine	0	1	0	0	1
<b>Total from diamond mines</b>						<b>32</b>
<b>Gold</b>	Anglogold Health Serv (Free State)	1	1	0	0	2
	Ardo Holdings Gold Mine	0	1	0	0	1
	Balmoral Gold Mine	0	1	0	0	1
	Bambanani GM	3	0	0	0	3
	Beatrix Gold	43	3	0	0	46
	Beisa GM	1	0	0	0	1
	Blyvoorquizicht	1	15	0	0	16
	Bracken Mines	0	3	0	0	3
	Brakpan Gold Mine	2	2	0	0	4
	Buffelsfontein Gold	24	19	0	0	43
	Carletonville GM	0	1	0	0	1
	City Deep	0	5	0	0	5
	Consolidated Main Reef	0	1	0	0	1
	Crown Mines	1	6	0	0	7
	Daggasfontein	0	2	0	0	2
	Deelkraal	17	3	0	0	20
	Doornfontein	0	13	0	0	13
	Durban Roodepoort Deep	5	8	0	0	13

East Driefontein	52	12	0	0	64
East Geduld	0	2	0	0	2
East Rand Prop	2	14	0	0	16
Elandsrand	30	5	0	0	35
Ellaton GM	0	1	0	0	1
Elsburg GM	0	1	0	0	1
Evander GM	53	4	0	0	57
Freddies Gold	35	5	0	0	40
Free State Geduld	7	15	0	0	22
Free State Saaiplaas	8	5	0	0	13
Future Gold Mine	0	1	0	0	1
Gold mine	1	0	0	0	1
Goldfields	2	1	0	0	3
Grootvlei Prop	2	10	0	0	12
Harmony	110	22	0	0	132
Hartebeesfontein	56	23	0	0	79
Heidelberg Gold Mine	0	1	0	0	1
J.I.C. Gold Mine	14	0	0	0	14
Joel	10	3	0	0	13
Kalahari Goldridge mine	1	0	0	0	1
Kinross	8	4	0	0	12
Kloof	55	20	0	0	75
Kopanang Gold Mine	1	0	0	0	1
Leeudoorn	29	6	0	0	35
Leslie	0	3	0	0	3
Libanon	46	11	0	0	57
Loraine	5	9	0	0	14
Luipaardsvlei Estate GM	0	1	0	0	1
Mali Gold Mine	0	1	0	0	1
Marievale	0	3	0	0	3
Masimong Gold Mine	11	0	0	0	11
Matjabeng GM	9	0	0	0	9
Modderfontein	0	1	0	0	1
Motlhobeng GM	0	1	0	0	1
New Consort	0	1	0	0	1
New Kleinfontein GM	0	1	0	0	1
Oryx	31	0	0	0	31
Placerdome GM	1	0	0	0	1
President Brand	4	11	0	0	15
President Steyn	42	16	0	0	58
Primrose GM	0	1	0	0	1
Rand Leases	0	3	0	0	3
Randfontein	20	18	1	0	39
Rand Refinery	0	1	0	0	1
Robinson Gold Mine	0	1	0	0	1
S A Land	0	1	0	0	1
Saaiplaas GM	1	2	0	0	3
SAMAT GM	0	1	0	0	1
Sheba	0	2	0	0	2
Skeat Gold Mine	0	1	0	0	1
Springs GM	0	2	0	0	2
St Helena	33	8	0	0	41
State GM	0	1	0	0	1
Steelpoort	0	1	0	0	1
Stilfontein	0	18	0	0	18
Sub Nigel	0	1	0	0	1
Tshepone GM	2	0	0	0	2
Unisel GM	2	1	0	0	3

	Vaal Reefs	267	41	0	0	308
	Ventersport	0	9	0	0	9
	Village Main Reef	0	1	1	0	2
	Virginia GM	2	2	0	0	4
	Vlakfontein	0	3	0	0	3
	Welkom GM	6	5	0	0	11
	West Driefontein	47	24	0	0	71
	West Rand Consolidation	0	6	0	0	6
	West Witwatersrand	4	1	0	0	5
	Western Areas	12	24	0	0	36
	Western Deep Levels	70	27	0	0	97
	Western Holdings	47	10	0	0	57
	Western Smelters	0	1	0	0	1
	Winkelhaak	2	2	0	0	4
<b>Total from gold mines</b>						<b>1757</b>
<b>Platinum</b>	Amadelbult Platinum (Rustenburg)	21	0	0	0	21
	Atok Platinum	12	2	0	0	14
	Eastern Platinum Mine	5	0	0	0	5
	Helam Platinum mine	0	1	0	0	1
	Impala Platinum	102	15	0	0	117
	Lebowa Platinum Mine	3	1	0	0	4
	Messina Platinum Mine	0	1	0	0	1
	Northam Platinum	7	1	0	0	8
	Rustenburg Platinum	192	23	0	0	215
	Swartklip Platinum	1	0	0	0	1
	Western Platinum	3	4	0	0	7
	Wildebeestfontein	1	0	0	0	1
	Zondereinde Platinum Mine	11	0	0	0	11
<b>Total from platinum mines</b>						<b>406</b>
<b>Iron</b>	Sishen Iron Mine	0	2	0	0	2
	Thabazimbi Iron Mine	0	3	0	0	3
<b>Total from iron mines</b>						<b>5</b>
<b>Iron &amp; Manganese</b>	Associated Manganese	3	5	0	0	8
<b>Lead &amp; Minerals</b>	Blackmountain	0	1	0	0	1
<b>Lime</b>	Union Lime	0	1	0	0	1
<b>Manganese</b>	S A Manganese	2	5	0	0	7
	Manganese mine	2	0	0	0	2
<b>Minerals</b>	African Rainbow Minerals & Expl	25	0	0	0	25
<b>Non Mineral</b>	Anglo power	0	1	0	0	1
	Industry	2	2	0	0	4
	Non Miner	1	3	0	0	4
	Spoornet	0	2	0	0	2
<b>Total from non-mineral</b>						<b>11</b>
<b>Quarries</b>	Hippo Quarries	0	1	0	0	1
	Marikana Granite	1	0	0	0	1
	Petsa Quarries	0	1	0	0	1
	Van Dyk	0	1	0	0	1
<b>Total from quarries</b>						<b>4</b>
<b>Shaft Sinkers</b>	Shaft Sinkers	2	0	0	0	2
<b>Silica</b>	Silicon Smelters	4	2	0	0	6
<b>Steel</b>	Highveld Steel and Vanadium	1	0	0	0	1

	Middelburg Steel and Alloys	0	1	0	0	<b>1</b>
<b>Steel &amp; Iron</b>	Iskor	3	25	1	0	<b>29</b>
<b>Vanadium</b>						
<b>Vanadium</b>	Rand Carbide Vanadium Mine	0	1	0	0	<b>1</b>
<b>Zinc</b>	Zinc Corporation	1	0	0	0	<b>1</b>
<b>Unknown</b>	Unknown	32	28	2	8	<b>70</b>
<b>TOTALS</b>		<b>1798</b>	<b>761</b>	<b>41</b>	<b>8</b>	<b>2608</b>