



## **DEPARTMENT OF HEALTH**

**Pathology Division  
Report:  
Demographic Data and  
Disease Rates for  
January - December  
1998**

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**NATIONAL CENTRE FOR  
OCCUPATIONAL HEALTH**

**NCOH Report**

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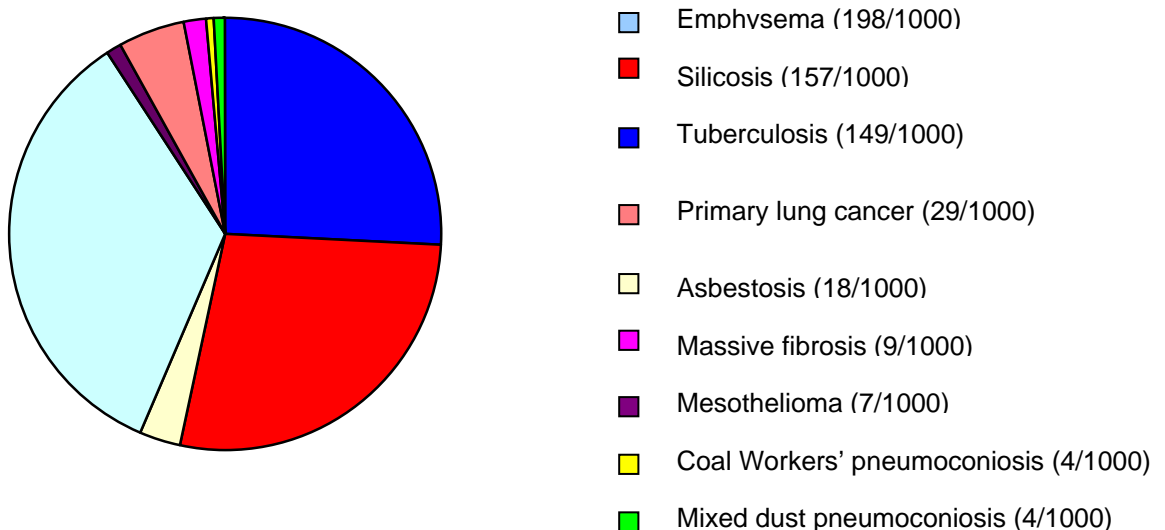
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## EXECUTIVE SUMMARY

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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 1998, 2880 cases came to autopsy at the NCOH. Of these, 68.65% were black men, 29.03% whites, 1.7% coloureds, 0.03% Indian and 0.59% were submitted without information on the ethnic group. Overall disease rates (per 1000 cases) for 1998 are as follows:



- The rate of pulmonary tuberculosis for all commodity groups has increased markedly since 1990
- The rate of silicosis is unchanged since 1975

## 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 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 second of the new format reports and describes autopsy cases examined during 1998, and presents disease rates from 1975-1998.

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

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The number of autopsies performed since 1975 is presented in Table 2-1. The numbers shown in the 1997 report have been updated because the 1975-1995 database can now be accessed using the SAS system.

**TABLE 2-1 DISTRIBUTION OF AUTOPSIES BY YEAR & ETHNIC GROUP  
(1975-1998)**

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
<b>TOTAL</b>	<b>51 996</b>	<b>66</b>	<b>25 111</b>	<b>32</b>	<b>1 270</b>	<b>1.6</b>	<b>1</b>	<b>0.001</b>	<b>49</b>	<b>0.06</b>	<b>78 427</b>

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

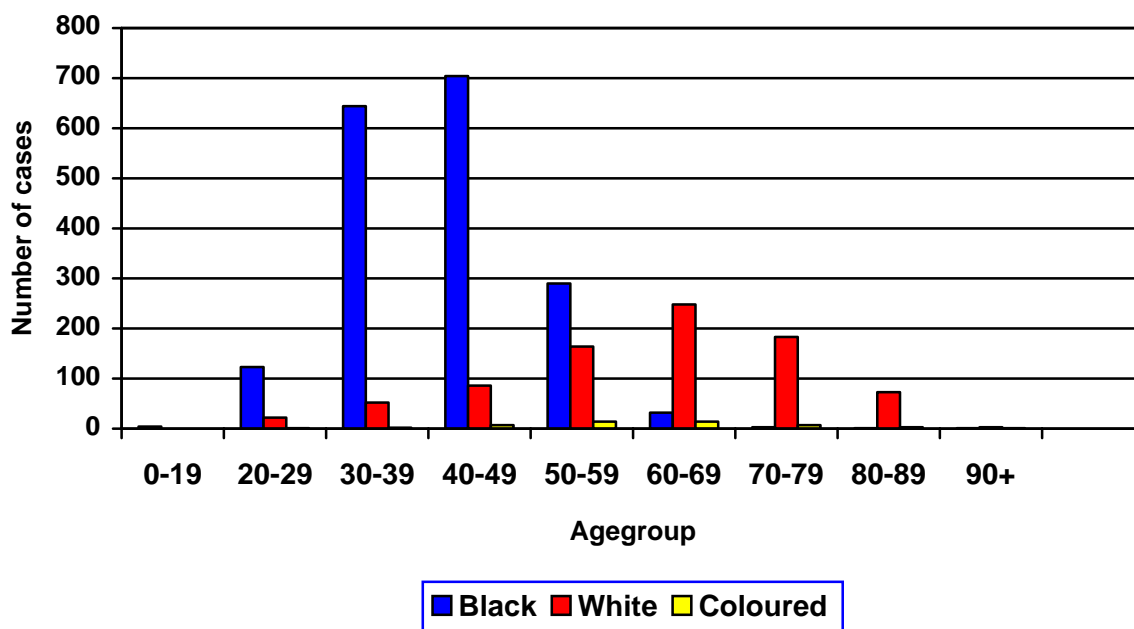
It is important to note that there is a referral bias in that black men are infrequently autopsied after leaving employment in the mines, whereas the majority of whites come to autopsy after retirement.

The age distribution of autopsies for 1998 is shown in Table 2-2 and Fig 2-1.

**TABLE 2-2 NUMBERS OF AUTOPSIES BY AGE & ETHNIC GROUP (1998)**

Age group	Black		White		Coloured		Indian		Unknown		All races	
	N	%	N	%	N	%	N	%	N	%	N	%
0-19	4	0.2	0	0.0	0	0.0	0	0.0	0	0.0	4	0.1
20-29	123	6.2	22	2.6	1	2.0	0	0.0	0	0.0	146	5.1
30-39	644	32.6	52	6.2	2	4.1	1	100.0	0	0.0	699	24.3
40-49	704	35.6	86	10.3	7	14.3	0	0.0	0	0.0	797	27.7
50-59	290	14.7	164	19.6	14	28.6	0	0.0	0	0.0	468	16.3
60-69	32	1.6	248	29.7	14	28.6	0	0.0	0	0.0	294	10.2
70-79	3	0.2	183	21.9	7	14.3	0	0.0	0	0.0	193	6.7
80-89	1	0.1	73	8.7	3	6.1	0	0.0	0	0.0	77	2.7
90+	1	0.1	3	0.4	1	2.0	0	0.0	0	0.0	5	0.2
Unknown	175	8.9	5	0.6	0	0.0	0	0.0	17	100	197	6.8
<b>Total</b>	<b>1977</b>	<b>100</b>	<b>836</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>1</b>	<b>100</b>	<b>17</b>	<b>100</b>	<b>2880</b>	<b>100</b>

**FIG 2-1 DISTRIBUTION OF AUTOPSIES BY AGE & ETHNIC GROUP(1998)**



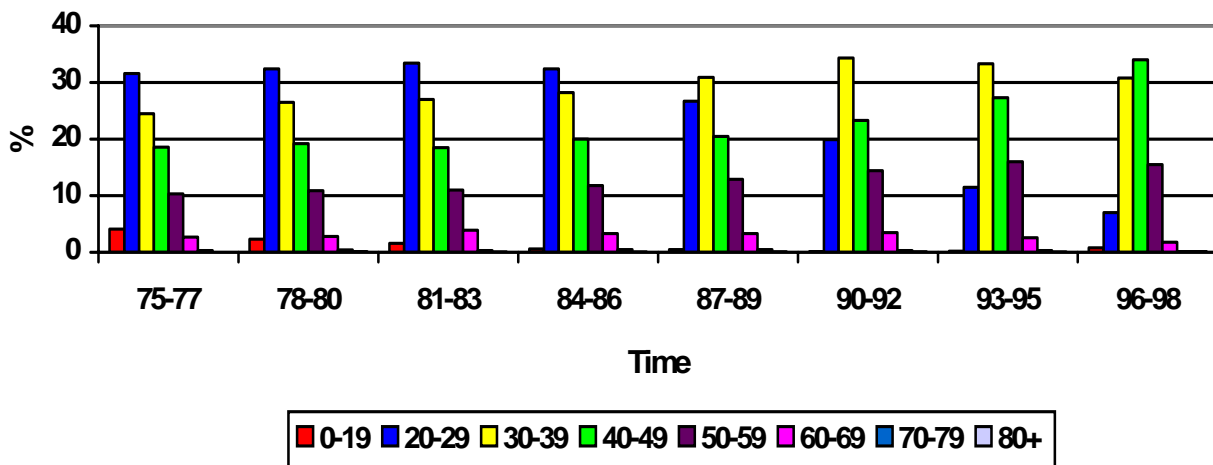
In 1998 the mean age for black miners was 37.9 years and for white miners 61.3 years. The difference in autopsy distribution by age over the period 1975-1998 is illustrated in Table 2-3 and in Figures 2-2 and 2-3 this distribution is shown for black and white miners. The

proportion of miners younger than 30 years decreased from 27.1% ('75-'77) to 6.2% ('96-'98).

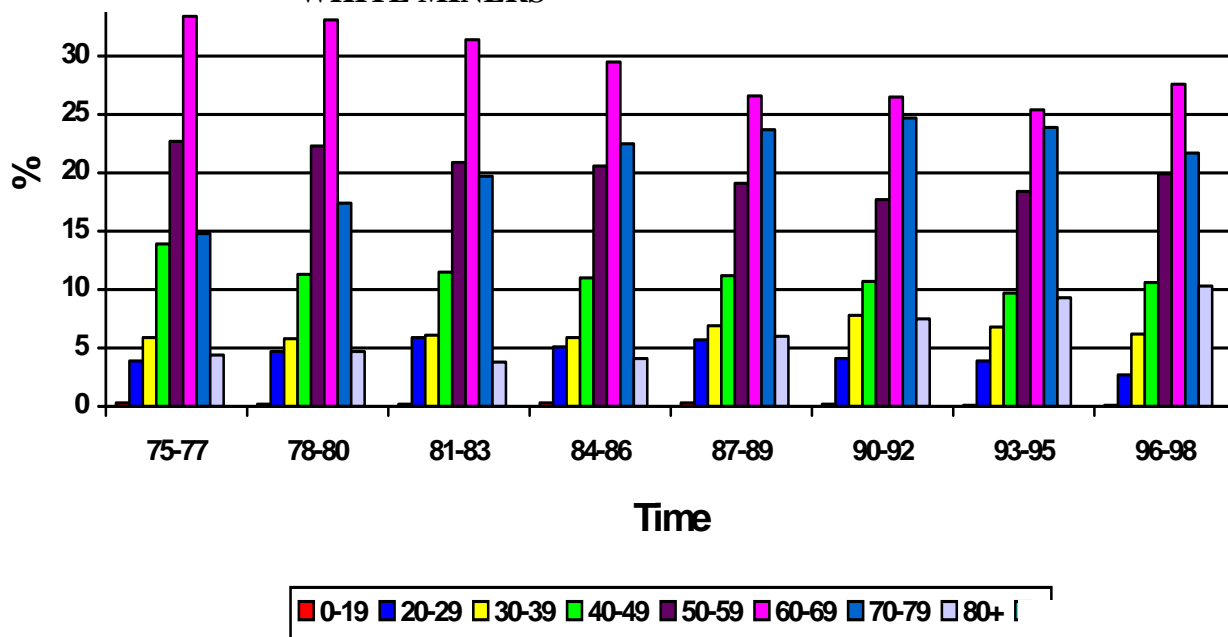
**TABLE 2-3 DISTRIBUTION OF AUTOPSIES (%) BY AGE & YEAR OF AUTOPSY (1975-1998)**

Year of autopsy								
	'75-'77	'78-'80	'81-'83	'84-'86	'87-'89	'90-'92	'93-'95	'96-'98
Age at Death	Proportion of miners (%)							
0-19	2.8	1.5	0.9	0.4	0.4	0.1	0.1	0.2
20-29	24.3	23.4	23.6	22.8	19.0	13.1	7.8	6.0
30-39	19.3	19.4	19.7	20.0	22.5	24.3	24.4	23.1
40-49	17.7	16.9	16.1	16.5	17.3	19.0	22.4	26.7
50-59	14.8	15.1	14.8	15.1	15.6	16.6	18.2	16.8
60-69	13.8	14.6	15.0	14.0	12.6	13.1	12.4	10.0
70-79	5.7	7.1	8.3	9.4	10.0	10.6	10.3	6.6
80+	1.6	2.0	1.6	1.7	2.7	3.3	4.3	3.2

**FIG 2-2 DISTRIBUTION OF AUTOPSIES BY AGE OVER TIME FOR BLACK MINERS**



**FIG 2-3 DISTRIBUTION OF AUTOPSIES BY AGE OVER TIME FOR WHITE MINERS**



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 2-4 presents the distribution of autopsies by ethnic group for 1998. Autopsies of cardiorespiratory organs only comprised 92% of examinations.

**TABLE 2-4 NUMBER OF AUTOPSIES BY TYPE & ETHNIC GROUP (1998)**

	Black		White		Coloured		Indian		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
<b>Cardiorespiratory organs only</b>	1932	98	656	79	48	98	1	100	17	100	2654	92
<b>Full autopsy</b>	45	2	180	21	1	2	0	0	0	0	226	8
<b>TOTAL</b>	1977		836		49		1		17		2880	

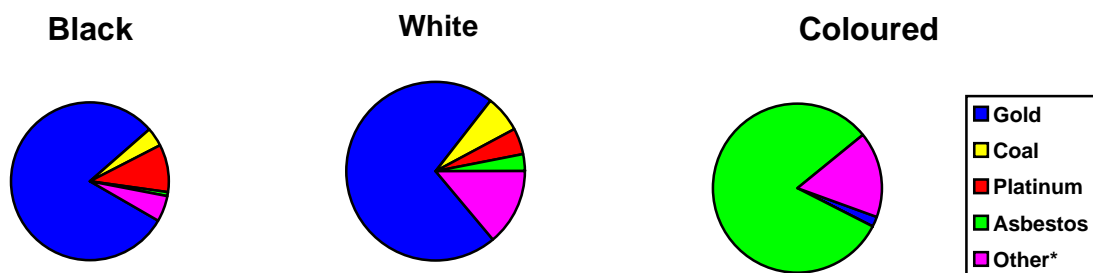
Table 2-5 and Figure 2-4 show the distribution of autopsies by industry and ethnic group for 1998. The majority of miners were from the gold mining industry (77%). Coloured miners comprised 81% of the 84 cases from asbestos mines.



**TABLE 2-5 NUMBER OF AUTOPSIES BY INDUSTRY & ETHNIC GROUP (1998)**

	Black		White		Coloured		Indian		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
Gold	1587	80.3	600	71.8	1	2.0	1	100	0	0.0	2189	76.9
Coal	80	4.0	54	6.5	0	0.0	0	0.0	0	0.0	134	4.7
Platinum	188	9.5	40	4.8	0	0.0	0	0.0	0	0.0	228	8.0
Asbestos	20	1.0	24	2.9	40	81.6	0	0.0	0	0.0	84	3.0
Diamond	13	0.7	10	1.2	2	4.1	0	0.0	0	0.0	25	0.9
Copper	4	0.2	18	2.2	4	8.2	0	0.0	0	0.0	26	0.9
Iskor	4	0.2	38	4.5	1	2.0	0	0.0	0	0.0	43	1.5
Other	18	0.9	19	2.3	1	2.0	0	0.0	0	0.0	38	1.3
Unknown	63	3.2	33	3.9	0	0.0	0	0.0	17	100	113	2.8
Total	1977	100	836	100	49	100	1	100	17	100	2880	100

**FIG 2-4 DISTRIBUTION OF AUTOPSIES BY INDUSTRY & ETHNIC GROUP (1998)**



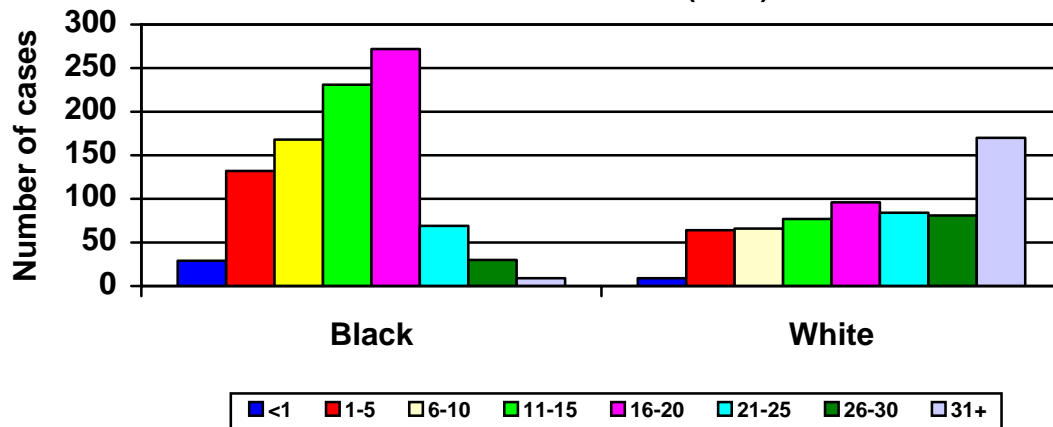
\* Includes copper, diamond, quarry, silica (silicon smelters), manganese, tin, zinc, minerals, chrome and iron as well as cases where information about type of mining is missing

Detailed information about the years in mining service by ethnic group is given in Table 2-6. 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 (43%), which is a reflection of the poor quality of the data provided by the mines.

**TABLE 2-6 NUMBER OF AUTOPSIES BY YEARS OF SERVICE & ETHNIC GROUP (1998)**

	Black		White		Coloured		Indian		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
<1	29	1.5	9	1.1	0	0.0	0	0.0	0	0.0	38	1.3
1-5	132	6.7	64	7.7	9	18.4	1	100	0	0.0	206	7.2
6-10	168	8.5	66	7.9	8	16.3	0	0.0	0	0.0	242	8.5
11-15	231	11.7	77	9.2	9	18.4	0	0.0	0	0.0	317	11.1
16-20	272	13.8	96	11.5	2	4.1	0	0.0	0	0.0	370	13.0
21-25	69	3.5	84	10.0	3	6.1	0	0.0	0	0.0	156	5.5
26-30	30	1.5	81	9.7	2	4.1	0	0.0	0	0.0	113	4.0
31+	9	0.5	170	20.3	0	0.0	0	0.0	0	0.0	179	6.3
Missing	1037	52.5	189	22.6	16	32.7	0	0.0	17	100	1259	43.0
<b>Total</b>	<b>1977</b>	<b>100</b>	<b>836</b>	<b>100</b>	<b>49</b>	<b>100</b>	<b>1</b>	<b>100</b>	<b>17</b>		<b>2880</b>	<b>100</b>

**FIG 2-5 DISTRIBUTION OF AUTOPSIES BY YEARS OF SERVICE & ETHNIC GROUP (1998)**



The mean duration of service & age by mining type and ethnic group is shown in Table 2-7.

**TABLE 2-7: MEAN DURATION OF SERVICE AND MEAN AGE BY MINE TYPE & ETHNIC GROUP (1998)**

Minetype	Black					White				
	N	Age		Service		N	Age		Service	
		Mean	SD	Mean	SD		Mean	SD	Mean	SD
Gold	1587	37.2	14.3	13.7	7.0	600	62.2	14.8	22.9	12.1
Coal	80	40.5	11.4	15.0	7.9	54	54.3	18.3	20.7	9.8
Platinum	188	42.9	11.4	10.5	6.1	40	59.2	13.4	15.5	9.8
Asbestos	20	51.3	13.5	7.1	6.9	24	63.0	7.9	12.7	8.8
Diamond	13	37.3	18.5	13.0	9.9	10	59.5	14.3	18.3	12.1
Copper	4	51.0	14.4	0.0*	0.0	18	61.9	12.7	19.7	7.9
Iscor	4	48.5	13.5	0.0*	0.0	38	57.6	11.2	17.8	11.7
Other	18	48.3	10.5	17.8	6.4	19	59.3	17.5	16.9	11.2
Unknown	63	28.6	21.3	0.0	0.0	33	61.6	19.2	0.0	0.0
<b>Total</b>	1977					836				

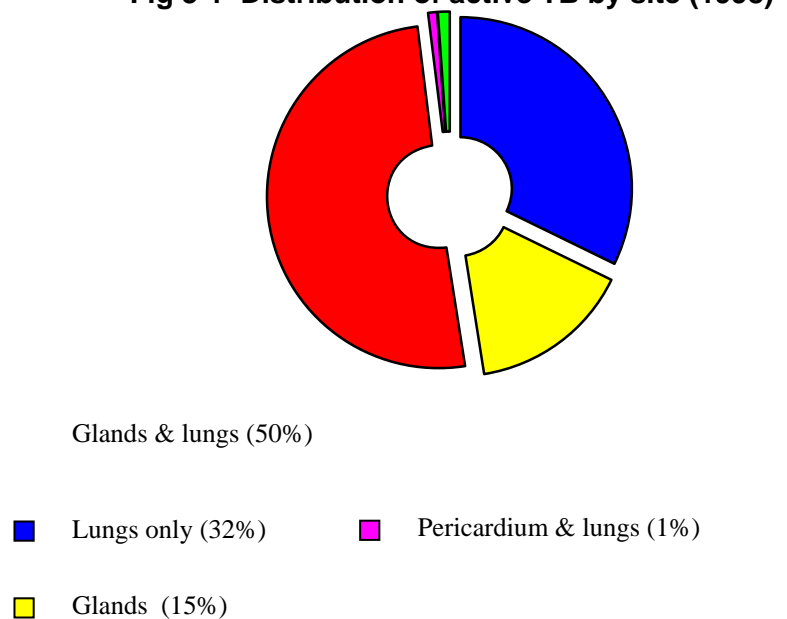
\*Duration of service not known

## SECTION 3 – ACTIVE TUBERCULOSIS

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Active tuberculosis was diagnosed in 510 (18%) of all the cases autopsied in 1998 (Fig 3-1), in comparison with the 466 (14%) cases of the previous year. The distribution of tuberculosis (TB) by anatomical site is presented in Fig 3-1. 84% of TB cases had active **pulmonary** tuberculosis (PTB). Of the PTB cases, 91.3% involved the lungs extensively. 95% (407 cases) of PTB cases were black, 4% (19 cases) white, 0.7% (3 cases) coloured miners and in 0.3% (1 case) the ethnic group was unknown. 88% of all PTB cases came from the gold mines and most of the PTB cases were in the age group 30-49.

**Fig 3-1 Distribution of active TB by site (1998)**



In 69% of cases of pulmonary tuberculosis found at autopsy, the disease was not mentioned in the clinical notes which were s

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 (1998)**

Age group	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	23	187	0	0	0	0	0	0	23	157
30-39	131	203	1	19	0	0	0	0	132	189
40-49	145	206	0	0	1	143	0	0	146	183
50-59	53	183	7	43	2	143	0	0	62	132
60-69	5	156	7	28	0	0	0	0	12	41
70-79	1	333*	3	16	0	0	0	0	4	21
80-89	1	1000*	1	14	0	0	0	0	2	26
Missing	48	274	0	0	0	0	1	59	49	249
<b>TOTAL</b>	<b>407</b>	<b>206</b>	<b>19</b>	<b>23</b>	<b>3</b>	<b>61</b>	<b>1</b>	<b>59</b>	<b>430</b>	<b>149</b>

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. 87.4% of active PTB cases came from the gold mining industry (77% of all autopsy cases came from that industry).

**TABLE 3-2 NUMBER & PREVALENCE OF ACTIVE PTB BY INDUSTRY & ETHNIC GROUP (1998)**

Industry	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	361	227	14	23	1	1000*	0	0	376	172
Coal	8	100	0	0	0	0	0	0	8	60
Platinum	21	112	1	25	0	0	0	0	22	96
Asbestos	5	250	2	83	2	50	0	0	9	107
Iscor	1	250	0	0	0	0	0	0	1	23
Diamond	0	0	1	100	0	0	0	0	1	40
Unknown	11	175	1	30	0	0	1	59	13	27
<b>TOTAL</b>	<b>407</b>	<b>206</b>	<b>19</b>	<b>23</b>	<b>3</b>	<b>61</b>	<b>1</b>	<b>59</b>	<b>430</b>	<b>149</b>

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

The prevalence for PTB from 1975-1998 is presented in Fig 3-3. There was a gradual increase in the prevalence (per 1000) for PTB from 33 in 1975 to 50 in 1990 and a marked increase to 149.3 in 1998.

Note: Rates for 1996 were calculated from data for approximately 6 months

**Fig 3-3 Rates of PTB from 1975-1998**



## SECTION 4 – SILICOSIS

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Silicotic nodules were found in the lungs in 452 cases (16% of all autopsies). 91% of these cases came from the gold mining industry. Of all cases of silicosis, occasional silicotic nodules were found in 39%, a few in 20%, a moderate number in 25% and a large number in 16%.

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 (1998)**

Age group	Black		White		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
30-39	42	65	2	38	0	0	44	63
40-49	158	224	8	93	0	0	166	208
50-59	78	269	25	152	0	0	103	220
60-69	7	219	43	235	0	0	50	170
70-79	0	0	37	202	0	0	37	192
80-89	1	1000*	22	301	0	0	23	299
90+	0	0	3	1000*	0	0	3	600*
Missing	23	131	2	400*	1	59	26	132
<b>TOTAL</b>	<b>309</b>	<b>156</b>	<b>142</b>	<b>170</b>	<b>1</b>	<b>59</b>	<b>452</b>	<b>157</b>

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 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.

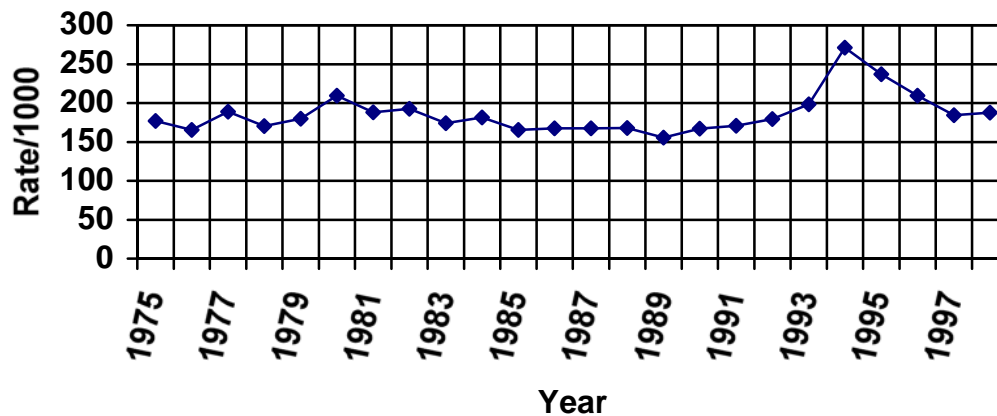
**TABLE 4-2 NUMBER & PREVALENCE OF SILICOSIS BY INDUSTRY & ETHNIC GROUP (1998)**

Industry	Black		White		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	286	180	125	208	0	0	411	188
Platinum	5	27	4	100	0	0	9	39
Coal	4	50	3	56	0	0	7	52
Copper	1	250*	3	167	0	0	4	154
Asbestos	2	100	1	42	0	0	3	36
Diamond	2	154	0	0	0	0	2	80
Other	0	0	2	105	0	0	2	53
Unknown	9	143	4	121	1	59	14	124
<b>TOTAL</b>	<b>309</b>	<b>156</b>	<b>142</b>	<b>170</b>	<b>1</b>	<b>59</b>	<b>452</b>	<b>157</b>

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 prevalence of silicosis from 1975 to 1998 in the gold mines is presented in Fig 4-2. Overall the rate of silicosis is unchanged since 1975. The high rate in 1994 cannot be explained.

**FIG 4-2 PREVALENCE RATES OF SILICOSIS FROM 1975-1998 in SA GOLD MINES**





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

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### **MASSIVE FIBROSIS**

There were 27 (0.9%) cases of massive fibrosis (18 black, 9 white) and the majority of them (89%) came from the gold mining industry. Most cases were in the age group 40-49.

### **COAL WORKERS’ PNEUMOCONIOSIS**

There were 10 cases of coal workers’ pneumoconiosis.

### **MIXED DUST FIBROSIS**

There were 12 (0.4%) cases of mixed dust fibrosis of whom 83% came from the gold mining industry.

### **ASBESTOSIS**

There were 51 (1.8%) cases of asbestosis of which 33% had slight interstitial fibrosis, 55% moderate and 12% marked. Amongst all cases with a history of asbestos exposure, there were only 9 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 except 1 of the coloured miners with asbestosis came from asbestos mines as did the majority of blacks and whites with this disease. Most of the remaining cases were from the gold mines.

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 (1998)**

Age group	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
30-39	3	5	0	0	0	0	3	4
40-49	5	7	0	0	1	143	6	8
50-59	4	14	5	30	2	143	11	24
60-69	3	94	11	44	6	429	20	68
70-79	0	0	4	22	4	571	8	41
80-89	1	1000*	0	0	2	667	3	39
<b>TOTAL</b>	<b>16</b>	<b>8</b>	<b>20</b>	<b>24</b>	<b>15</b>	<b>306</b>	<b>51</b>	<b>18</b>

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

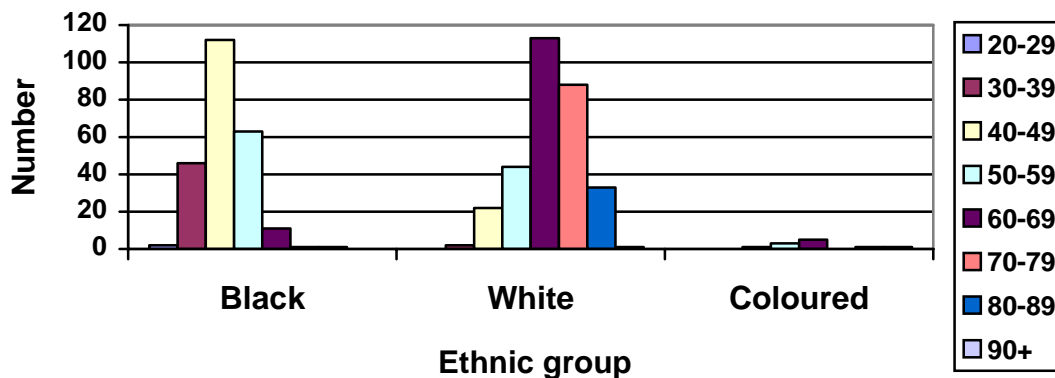
There were 571 cases of emphysema, the extent of which was mild in 72%, moderate in 24% and marked in 4%. The distribution of emphysema by age and ethnic group is presented in Table 6-1 and Fig 6-1.

**TABLE 6-1 NUMBER & PREVALENCE OF EMPHYSEMA BY AGE & ETHNIC GROUP (1998)**

Age group	Black		White		Coloured		Unknown		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	2	16	0	0	0	0	0	0	2	14
30-39	46	71	2	39	0	0	0	0	48	69
40-49	112	159	22	256	1	143	0	0	135	169
50-59	63	217	44	268	3	214	0	0	110	235
60-69	11	344	113	456	5	357	0	0	129	461
70-79	1	333*	88	481	0	0	0	0	89	439
80-89	1	1000*	33	452	1	333*	0	0	35	455
90+	0	0	1	333*	1	1000*	0	0	2	400*
Missing	19	109	1	200*	0	0	1	59	21	107
<b>TOTAL</b>	<b>255</b>	<b>129</b>	<b>304</b>	<b>364</b>	<b>11</b>	<b>224</b>	<b>1</b>	<b>59</b>	<b>571</b>	<b>198</b>

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 (1998)**



For black and white miners with emphysema, the majority were from the gold mining industry (76%) (Table 6-2), whereas all the 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 (1998)**

Industry	Black		White		Coloured		Unknown		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	208	131	223	372	0	0	0	0	431	197
Platinum	18	96	15	375	0	0	0	0	33	145
Coal	11	138	17	315	0	0	0	0	28	209
Asbestos	5	250	8	333	11	275	0	0	24	286
Iscor	1	250*	11	289	0	0	0	0	12	279
Copper	0	0	10	555	0	0	0	0	10	385
Diamond	1	77	3	300	0	0	0	0	4	160
Other	4	222	6	316	0	0	0	0	10	263
Unknown	7	111	11	333	0	0	1	59	19	168
<b>TOTAL</b>	255	129	304	364	11	224	1	59	571	198

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

## SECTION 7 – MESOTHELIOMA

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In comparison with the 11 cases of 1997, there were 19 cases of mesothelioma in 1998. 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 (1998)**

Age Group	Black		White		Coloured		TOTAL	
	N	%	N	%	N	%	N	%
40-49	3	75.0	0	0.0	0	0.0	3	15.8
50-59	1	25.0	1	10.0	4	80.0	6	31.6
60-69	0	0.0	4	40.0	0	0.0	4	21.1
70-79	0	0.0	3	30.0	0	0.0	3	15.8
80-89	0	0.0	1	10.0	1	20.0	2	10.5
Missing	0	0.0	1	10.0	0	0.0	1	5.3
<b>TOTAL</b>	<b>4</b>		<b>10</b>		<b>5</b>		<b>19</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. The asbestos mining industry provided 44% of the mesothelioma cases in this series and the highest proportion of mesothelioma cases was found in white miners.

**TABLE 7-2 NUMBER OF MESOTHELIOMA CASES BY INDUSTRY & ETHNIC GROUP (1998)**

Industry	Black		White		Coloured		TOTAL	
	N	%	N	%	N	%	N	%
Asbestos	3	75.0	0	0.0	5	100.0	8	44.4
Gold	1	25.0	1	11.1	0	0.0	2	11.1
Iscor	0	0.0	1	11.1	0	0.0	1	5.6
Other	0	0.0	3	33.3	0	0.0	3	16.7
Unknown	0	0.0	5	44.4	0	0.0	5	22.2
<b>TOTAL</b>	<b>4</b>		<b>10</b>		<b>5</b>		<b>19</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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84 cases of primary lung cancer were found at autopsy of which 25% were in black miners, 70% in whites and 5% in coloured miners. Most of the cases were of the small cell type (31%), followed by large cell (24%) and squamous cell (23%) types.

The distribution of primary lung cancer by age and ethnic group is presented in Table 8-1 and Fig 8-1. Most black miners were in the age group 50-59 whereas the highest proportion of whites and coloureds were 60-69 years old.

**TABLE 8-1 NUMBER AND PREVALENCE OF PRIMARY LUNG CANCER BY AGE & ETHNIC GROUP (1998)**

Age group	Black		White		Coloured		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate
20-29	1	8	0	0	0	0	1	7
30-39	2	3	1	19	0	0	3	4
40-49	6	9	5	58	1	143*	12	15
50-59	8	28	13	79	1	71	22	47
60-69	1	31	20	81	2	143	23	78
70-79	0	0	13	71	0	0	13	67
80-89	0	0	6	82	0	0	6	78
Missing	3	17	1	200*	0	0	4	20
<b>TOTAL</b>	<b>21</b>	<b>11</b>	<b>59</b>	<b>71</b>	<b>4</b>	<b>82</b>	<b>84</b>	<b>29</b>

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 industry followed by the asbestos mining industry. For coloured miners, most cases were from the asbestos industry.

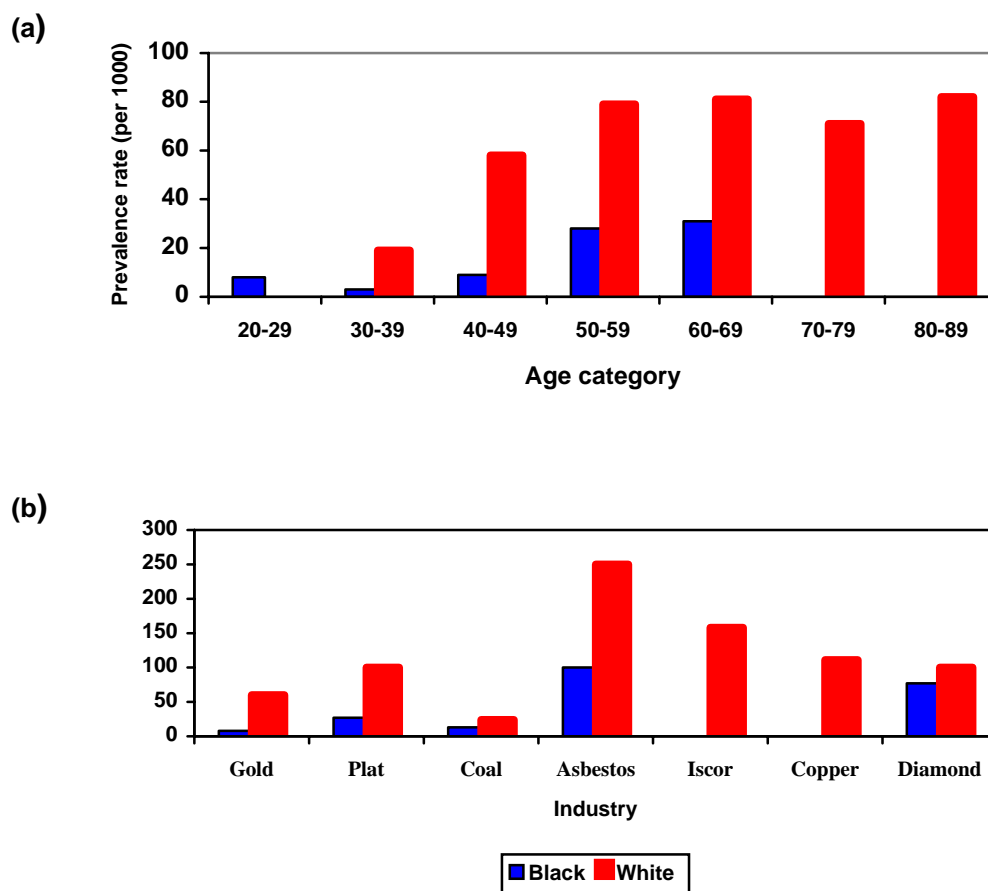
**TABLE 8-2 NUMBER AND PREVALENCE PRIMARY LUNG CANCER BY INDUSTRY & ETHNIC GROUP (1998)**

Industry	Black		White		Coloured		TOTAL	
	N	Rate	N	Rate	N	Rate	N	Rate
Asbestos	2	100	6	250	3	75	11	131
Coal	1	13	2	24	0	0	3	22
Copper	0	0	2	111	0	0	2	77
Diamond	1	77	1	100	1	500*	3	120
Gold	12	8	36	60	0	0	48	22
Iscor	0	0	6	158	0	0	6	140
Platinum	5	27	4	100	0	0	9	40
Unknown	0	0	2	38	0	0	2	18
<b>TOTAL</b>	<b>21</b>	<b>11</b>	<b>59</b>	<b>71</b>	<b>4</b>	<b>82</b>	<b>84</b>	<b>29</b>

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 (1998)**



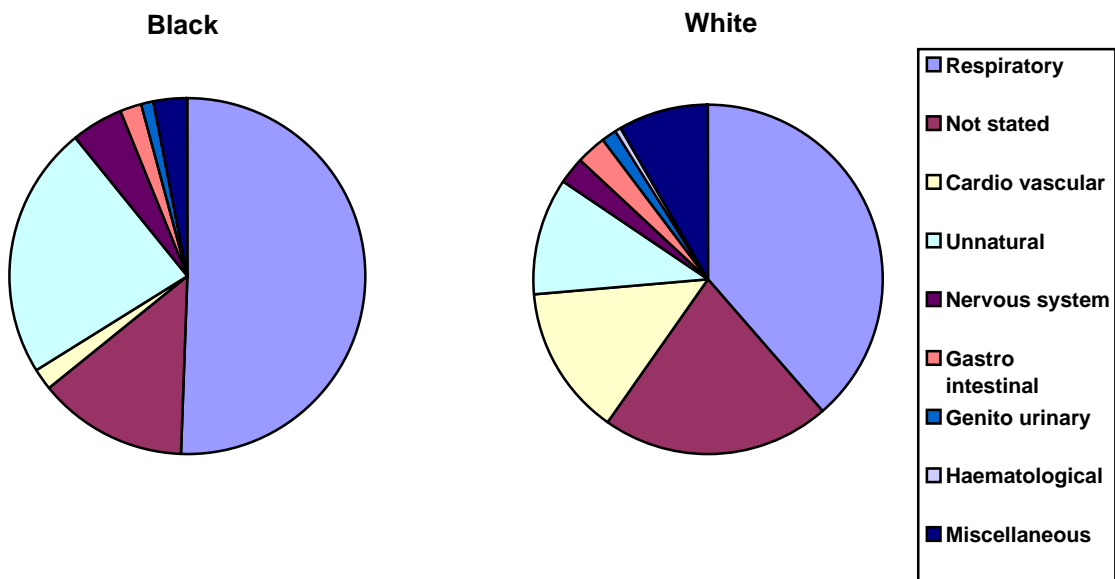
## SECTION 9 – CLINICAL CAUSES OF DEATH

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 (47%). Black miners had the highest proportion of unnatural causes of death (23%). In 16% the cause of death was not stated.

**TABLE 9-1 CAUSES OF DEATH BY ETHNIC GROUP (1998)**

	Black		White		Coloured		Indian		Unknown		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
Respiratory	998	50.5	323	38.7	30	61.2	0	0	0	0	1351	47.0
Unnatural	458	23.2	90	10.8	5	10.2	1	100	0	0	554	19.2
Not stated	271	13.7	176	21.0	6	12.2	0	0	16	94.1	469	16.3
Cardiovascular	36	1.8	117	14.0	4	8.2	0	0	0	0	157	5.5
Miscellaneous	61	3.1	70	8.4	2	4.1	0	0	1	5.9	134	4.7
Nervous system	94	4.8	21	2.5	0	0	0	0	0	0	115	4.0
GI tract	39	2	22	2.6	2	4.1	0	0	0	0	63	2.2
Genito urinary	19	1	13	1.6	0	0	0	0	0	0	32	1.1
Haematological	1	0.1	4	0.5	0	0	0	0	0	0	5	0.2
<b>TOTAL</b>	<b>1977</b>		<b>836</b>		<b>49</b>		<b>1</b>		<b>17</b>		<b>2880</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 THE DECEASED WORKED AT

MINETYPE	LAST MINE WORKED AT	BLACK	WHITE	COLOURED	INDIAN	UNKNOWN	TOTAL
Aluminium	Aluminium Smelters	0	1	0	0	0	1
<b>Total from aluminium mine</b>							<b>1</b>
Asbestos	African Chrysotile Asb	5	1	0	0	0	6
	Asbestos Mine	0	3	1	0	0	4
	Blackrich Asbestos	0	1	0	0	0	1
	Blouputs Asbestos Mine	1	0	0	0	0	1
	Cape Blue Asbestos	1	2	6	0	0	9
	Danielskuil Asb Mine	0	5	0	0	0	5
	Everite	0	0	1	0	0	1
	Gefco	5	4	1	0	0	10
	Glen Allen Asbestos Mine	0	1	0	0	0	1
	Kliphuis Asbestos	1	2	4	0	0	7
	Koegas Asbestos	2	0	14	0	0	16
	Laagsotry Asbestos Mine	1	0	0	0	0	1
	Mamoesa Asbestos Mine	0	0	1	0	0	1
	Noupoort Asbestos Mine	0	1	7	0	0	8
	Penge Asbestos	0	1	0	0	0	1
	Pomfret Asb Mine	1	1	2	0	0	4
	Wandrag Asbestos Mine	0	1	0	0	0	1
<b>Total from asbestos mines</b>							<b>77</b>
Chrome	Chrome Mine	1	2	0	0	0	3
	Dilokong chrome Mine	1	0	0	0	0	1
	Mooinooi chrome	1	0	0	0	0	1
	Tweefontein	5	1	0	0	0	6
	Waterkloof Chrome Mine	0	1	0	0	0	1
	Winterveld Chrome	0	1	0	0	0	1
<b>Total from chrome mines</b>							<b>13</b>
Coal	Arnot Colliery	2	2	0	0	0	4
	Bank Colliery	2	1	0	0	0	3
	Blinkpan Colliery	1	0	0	0	0	1
	Bosjesspruit Colliery	5	0	0	0	0	5
	Brandspruit Colliery	3	2	0	0	0	5
	Coalbrook Colliery	0	2	0	0	0	2
	Cornelia Colliery	0	2	0	0	0	2
	Delmas Colliery	0	1	0	0	0	1
	Douglas Colliery	1	6	0	0	0	7
	Duiker Colliery	3	0	0	0	0	3
	Durban Navigation Colliery	1	0	0	0	0	1
	Elandslaagte Colliery	0	1	0	0	0	1
	Ermelo Coal	0	1	0	0	0	1
	Greenside Colliery	1	2	0	0	0	3
	Grootgeluk Colliery	5	4	0	0	0	9
	Khutala Colliery	7	0	0	0	0	7
	Kleinkopje Colliery	0	2	0	0	0	2
	Koornfontein Coal	4	1	0	0	0	5
	Kriel Colliery	2	1	0	0	0	3
	Lakeside Colliery	0	1	0	0	0	1
	Landau Colliery	1	0	0	0	0	1
	Majuba Colliery	0	1	0	0	0	1
MINETYPE	LAST MINE WORKED AT	BLACK	WHITE	COLOURED	INDIAN	UNKNOWN	TOTAL
Coal	Matla Coal	3	3	0	0	0	6
	Middelbult Coal Mine	4	0	0	0	0	4
	New Denmark	3	1	0	0	0	4

	Nyati Coal Mine	0	1	0	0	0	1
	Phoenix Colliery	1	0	0	0	0	1
	Savemore Colliery	2	0	0	0	0	2
	Secunda Colliery	9	3	0	0	0	12
	Sigma Colliery	0	1	0	0	0	1
	Spingfield Colliery	0	2	0	0	0	2
	Spitzkop	3	0	0	0	0	3
	Springlake Colliery	0	1	0	0	0	1
	Tavistok Colliery	3	1	0	0	0	4
	Transvaal Navigation Coal	0	1	0	0	0	1
	Twistdraai	8	1	0	0	0	9
	Usutu Colliery	0	1	0	0	0	1
	Van Dyk`s Drift	1	1	0	0	0	2
	Vierfontein Colliery	0	1	0	0	0	1
	Vryheid Coronation	0	1	0	0	0	1
	Wankie Colliery	0	1	0	0	0	1
	Welgedacht	2	0	0	0	0	2
	Witbank Collieries	2	5	0	0	0	7
<b>Total from coal mines</b>							<b>134</b>
Copper	Copper Mine	0	1	1	0	0	2
	Messina Copper Mine	0	1	0	0	0	1
	O`Kiep Copper	2	6	3	0	0	11
	Phalaborwa	1	4	0	0	0	5
	Prieska	0	3	0	0	0	3
	Roan Antelope Copper	0	1	0	0	0	1
	Tsumeb Copper Mine	0	1	0	0	0	1
<b>Total from copper mines</b>							<b>24</b>
Diamonds	Bellsbank Diamond Mine	1	0	0	0	0	1
	Cullinan Diamond Mine	1	0	0	0	0	1
	Daradale Asbestos Mine	0	0	1	0	0	1
	De Beers Consolidated	7	8	2	0	0	17
	Finch Diamond Mine	1	0	0	0	0	1
	Loxton Exploration	0	1	0	0	0	1
	Messina Diamond Mine	1	0	0	0	0	1
	Premier Diamond	2	5	0	0	0	7
<b>Total from diamond mines</b>							<b>30</b>
Gold	Arcturus GM	0	1	0	0	0	1
	Barberton GM	0	1	0	0	0	1
	Beatrix Gold	40	3	0	0	0	43
	Blyvoorquizicht	12	16	0	0	0	28
	Bracken Mines	0	3	0	0	0	3
	Brakpan Gold Mine	0	2	0	0	0	2
	Bredlagte Gold	1	0	0	0	0	1
	Buffelsfontein Gold	21	19	0	0	0	40
	Carletonville GM	0	1	0	0	0	1
	City Deep	0	3	0	0	0	3
	Consolidated Main Reef	0	2	0	0	0	2
	Consolidated Modderfontein	0	1	0	0	0	1
<b>MINETYPE</b>	<b>LAST MINE WORKED AT</b>	<b>BLACK</b>	<b>WHITE</b>	<b>COLOURED</b>	<b>INDIAN</b>	<b>UNKNOWN</b>	<b>TOTAL</b>
Gold	Consolidated Murchison	0	2	0	0	0	2
	Consort GM	0	1	0	0	0	1
	Crown Mines	0	3	0	0	0	3
	Daggasfontein	0	4	0	0	0	4
	Deelkraal	8	5	0	0	0	13
	Doornfontein	2	15	0	0	0	17
	Durban Roodepoort Deep	16	11	0	0	0	27

	East Driefontein	103	7	0	0	0	110
	East Rand Prop	49	28	0	0	0	77
	Eastern Transvaal Consolidated	0	1	0	0	0	1
	Elandsrand	44	5	0	0	0	49
	Elsburg GM	0	1	0	0	0	1
	Evander GM	4	1	0	0	0	5
	Fairview Mine	0	1	0	0	0	1
	Freddies Gold	63	3	0	0	0	66
	Free State Geduld	5	21	0	0	0	26
	Free State Saaiplaas	17	7	0	0	0	24
	Goldfields	2	2	0	0	0	4
	Grootvlei Prop	12	14	0	0	0	26
	Harmony	118	18	1	0	0	137
	Hartebeesfontein	121	18	0	0	0	139
	J.I.C. Gold Mine	2	0	0	0	0	2
	Joel	9	1	0	0	0	10
	Kinross	28	6	0	0	0	34
	Klipval GM	0	1	0	0	0	1
	Kloof	81	16	0	0	0	97
	Leeudoorn	30	5	0	1	0	36
	Leslie	5	3	0	0	0	8
	Libanon	40	12	0	0	0	52
	Loraine	13	9	0	0	0	22
	Luipaardsvlei Estate GM	0	3	0	0	0	3
	Marievale	0	5	0	0	0	5
	Masimong Gold Mine	1	0	0	0	0	1
	Merriespruit GM	0	1	0	0	0	1
	Modderfontein	2	2	0	0	0	4
	Naledi GM	4	1	0	0	0	5
	New Kleinfontein GM	0	1	0	0	0	1
	Nigel GM	2	0	0	0	0	2
	Oryx	16	2	0	0	0	18
	President Brand	1	10	0	0	0	11
	President Steyn	74	13	0	0	0	87
	Primrose GM	0	1	0	0	0	1
	Rand Mines	0	1	0	0	0	1
	Randfontein	27	19	0	0	0	46
	Roodekop GM	0	1	0	0	0	1
	Rosedeeep Gold	0	1	0	0	0	1
	S A Land	0	4	0	0	0	4
	Saaiplaas GM	0	2	0	0	0	2
	South Roodepoort	0	1	0	0	0	1
	Springs GM	0	1	0	0	0	1
	St Helena	33	4	0	0	0	37
<b>MINETYPE</b>	<b>LAST MINE WORKED AT</b>	<b>BLACK</b>	<b>WHITE</b>	<b>COLOURED</b>	<b>INDIAN</b>	<b>UNKNOWN</b>	<b>TOTAL</b>
Gold	State GM	0	1	0	0	0	1
	Stillfontein	2	19	0	0	0	21
	Sub Nigel	0	1	0	0	0	1
	Unisel GM	1	2	0	0	0	3
	Vaal Reefs	266	45	0	0	0	311
	Ventersport	0	15	0	0	0	15
	Virginia GM	3	2	0	0	0	5
	Vlakfontein	0	3	0	0	0	3
	Vogelstruisbult	0	1	0	0	0	1
	Welkom GM	2	11	0	0	0	13
	West Driefontein	103	28	0	0	0	131

	West Rand Consolidation	0	17	0	0	0	17
	West Witwatersrand	1	1	0	0	0	2
	Western Areas	32	19	0	0	0	51
	Western Deep Levels	88	22	0	0	0	110
	Western Holdings	53	11	1	0	0	65
	Western Reef GM	0	1	0	0	0	1
	Winkelhaak	8	8	0	0	0	16
	Wit Nigel GM	0	2	0	0	0	2
	Zandpan GM	0	2	0	0	0	2
<b>Total from gold mines</b>							<b>2125</b>
Platinum	Amadelbult Platinum (Rustenburg)	4	0	0	0	0	4
	Atok Platinum	11	1	0	0	0	12
	Bafokeng	1	0	0	0	0	1
	Impala Platinum	16	15	0	0	0	31
	Northam Platinum	8	1	0	0	0	9
	R.U.C. Platinum Mine	1	1	0	0	0	2
	Rustenburg Platinum	146	34	0	0	0	180
	Tarleton Platinum	1	0	0	0	0	1
	Union Platinum	2	1	0	0	0	3
	Western Platinum	1	7	0	0	0	8
	Wildebeestfontein	2	0	0	0	0	2
<b>Total from platinum mines</b>							<b>253</b>
Iron	Thabazimbi Iron Mine	1	1	0	0	0	2
Iron & Manganese	Associated Manganese	2	1	0	0	0	3
Lead & Minerals	Blackmountain	0	0	1	0	0	1
Manganese	S A Manganese	5	0	0	0	0	5
Minerals	African Rainbow Minerals & Expl	13	0	0	0	0	13
Non Miner Quarry	Non Miner	1	2	0	0	0	3
	Hippo Quarries	0	1	0	0	0	1
	Van Dyk	0	1	0	0	0	1
Silica	Silicon Smelters	3	2	0	0	0	5
Steel	Highveld Steel and Vanadium	0	3	0	0	0	3
	Union Steel Mine	0	1	0	0	0	1
Steel & Iron	Iskor	4	38	1	0	0	43
Tin	Rooiberg Mineral Division	0	2	0	0	0	2
<b>MINETYPE</b>	<b>LAST MINE WORKED AT</b>	<b>BLACK</b>	<b>WHITE</b>	<b>COLOURED</b>	<b>INDIAN</b>	<b>UNKNOWN</b>	<b>TOTAL</b>
	UIS Tin Mine	0	1	0	0	0	1
Unknown	Unknown	70	50	1	0	16	137
Zinc	Zinc Corporation	0	2	0	0	0	2
<b>Total from miscellaneous mine types</b>							<b>223</b>
<b>TOTAL</b>		<b>1977</b>	<b>837</b>	<b>49</b>	<b>1</b>	<b>16</b>	<b>2880</b>