



# NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

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**Pathology Division  
Surveillance Report:  
Demographic Data and  
Disease Rates for  
January to December  
2004**

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**NIOH Report 7/2005**

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**NATIONAL HEALTH  
LABORATORY SERVICE**



## **ACKNOWLEDGEMENTS**

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

Anna Khumalo  
Goodman Rani  
Jay Vallabh  
Jemima Cantrell  
Johanna Dibedi  
Johannes Makoena  
Joseph Mukhovi  
Julienne Mkhize  
Juliet Buthelezi  
Martha Rikhotso  
May Humby  
Nora Ngutshane  
Patrick Mbhontsi  
Phyllis Back  
Rosinah Soko  
Simon Seopela  
Wilson Mashele

Thanks also to Michelle Kotze and Thomas Msiza (IT Directorate, National Department of Health) for upgrading and maintaining the PATHAUT system.

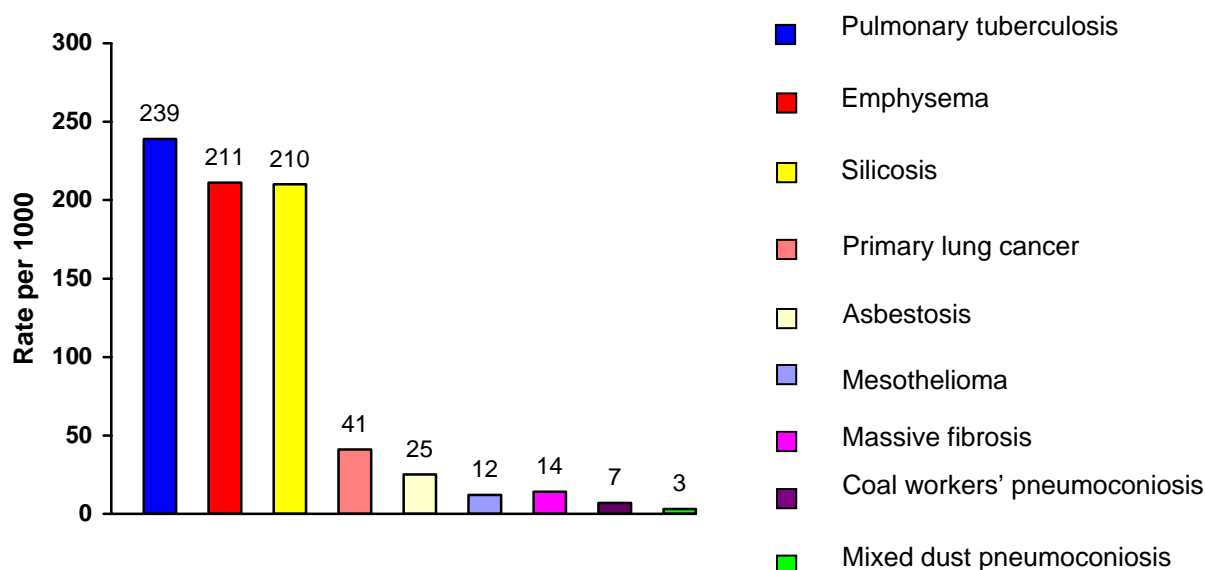
National Institute for Occupational Health, PO Box 4788, Johannesburg, 2000, South Africa

ISSN 1812-7681

## EXECUTIVE SUMMARY

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During 2004, 2 055 cases came to autopsy at the NIOH. Of these, 69.5% were black men, 29.0% were white, 1.1% were coloured and 0.4% were submitted without information on population group. Overall disease rates (per 1000 autopsies) for 2004 are shown in Figure 1.



**FIG. 1 OVERALL DISEASE RATES FOR 2004**

In 2004 the overall prevalence of silicosis increased from that in previous years. The prevalence of pulmonary tuberculosis (PTB) also increased, following the trend of the last several years. The rise in PTB was particularly evident in black gold miners where the rate increased from 328 per thousand in 2003 to 341 per thousand in 2004.

Concerted efforts to obtain service histories resulted in fewer cases with incomplete information in 2004. With the increase in numbers of female cases submitted for autopsy, efforts are underway to include females in the 2005 surveillance report.

During 2004, four journal articles utilising the PATHAUT data were published (see Appendix 2) and research findings were presented at a number of forums. An MSc student (University of the Witwatersrand) also used the data for her dissertation.

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## GLOSSARY

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

## SECTION 1 – BACKGROUND

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

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

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

This is the eighth consecutive annual report and describes autopsy cases examined during the year 2004. Many of the cases had “mixed” exposures in that they had been employed in more than one commodity. For simplicity, cases are categorised according to the commodity in which most years of service were recorded, i.e. the commodity in which the miners had worked for the longest period. In Appendix 1, however, the cases are listed according to the most recent (last) mine at which the miners worked.

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

## SECTION 2 – DEMOGRAPHIC DATA

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

**TABLE 2-1 DISTRIBUTION OF AUTOPSIES BY YEAR AND POPULATION GROUP (1975 - 2004)**

Year of autopsy	Black		White		Coloured		Indian		Unknown		Total
	N	%	N	%	N	%	N	%	N	%	N
1975	2 190	71	854	28	32	1					3 076
1976	2 335	68	1 072	31	27	1					3 434
1977	2 351	69	1 039	30	33	1					3 423
1978	2 245	67	1 090	32	32	1					3 367
1979	2 118	66	1 026	33	45	1					3 189
1980	2 338	64	1 274	35	46	1					3 658
1981	2 209	66	1 117	33	33	1					3 359
1982	2 312	63	1 302	36	44	1					3 658
1983	2 096	65	1 109	34	41	1					3 246
1984	1 966	64	1 098	36	28	1					3 092
1985	2 275	64	1 200	34	66	2					3 541
1986	2 456	68	1 125	31	45	1					3 626
1987	2 594	68	1 168	30	78	2					3 840
1988	2 518	67	1 165	31	77	2					3 760
1989	2 138	65	1 090	33	60	2					3 288
1990	2 172	64	1 155	34	51	2					3 378
1991	2 143	65	1 080	33	66	2					3 289
1992	2 144	66	1 049	32	70	2					3 263
1993	1 863	65	956	33	65	2					2 884
1994	1 737	61	1 021	36	94	3					2 852
1995	2 830	71	1 059	27	99	2					3 988
1996*	766	68	329	29	19	2			14	1.2	1 128
1997	2 223	69	897	28	70	2			18	0.6	3 208
1998	1 977	69	836	29	49	2	1		17	0.6	2 880
1999	1 656	65	832	33	29	1			12	0.5	2 529
2000	1 798	69	761	29	41	2			8	0.3	2 608
2001	1 690	67	813	32	13	1			13	0.5	2 529
2002	1 677	67	763	30	50	2			28	1.1	2 518
2003	1 536	66	745	32	23	1	1		13	0.6	2 318
2004	1 428	69	596	29	22	1	**1		**8	0.4	2 055
<b>Total</b>	<b>61 781</b>	<b>66</b>	<b>29 621</b>	<b>32</b>	<b>1 448</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>131</b>	<b>0.1</b>	<b>92 984</b>

\* Data for only  $\pm 6$  months are available for 1996

\*\* In all subsequent analyses, the Indian and unknown population groups have been combined

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



probably reflecting the concomitant decrease in the number of miners. In 1994 there were around 344 000 people employed in the gold mining industry compared to approximately 177 000 in 2004.

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

Table 2-2 shows the distribution of autopsies by population group for 2004. Autopsies of only the cardio-respiratory organs comprised 94.2% of all examinations.

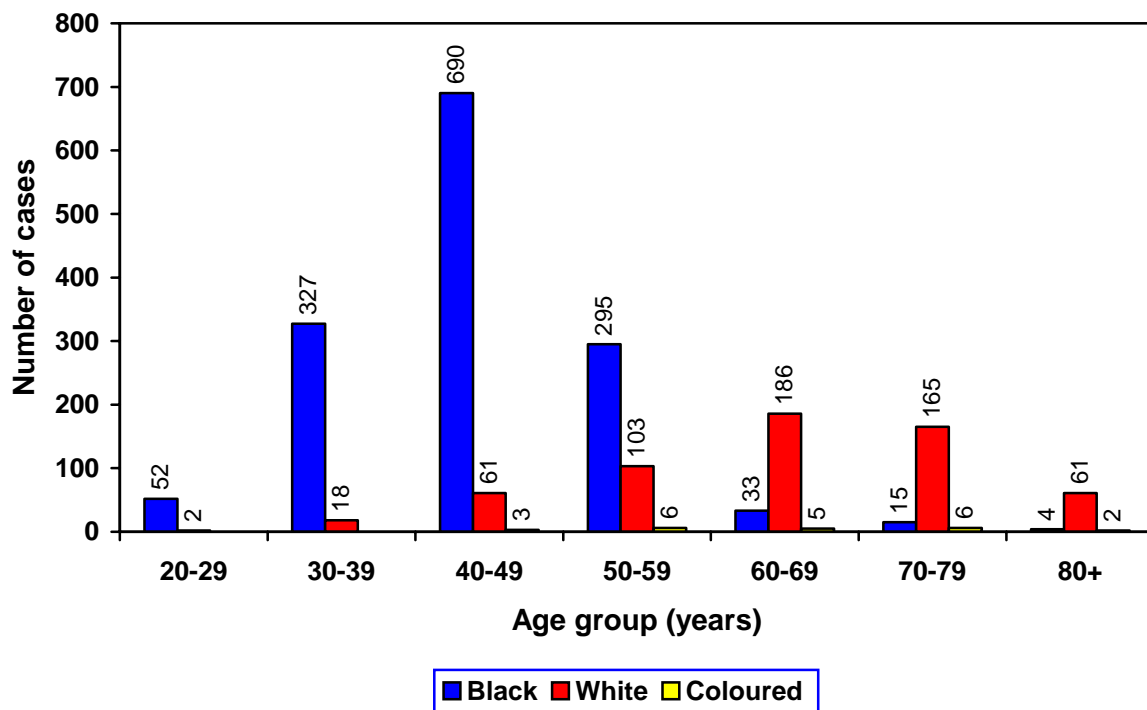
**TABLE 2-2 NUMBER AND PROPORTION OF AUTOPSIES BY TYPE AND POPULATION GROUP (2004)**

Autopsy type	Black		White		Coloured		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
Cardiorespiratory organs only	1422	99.6	484	81.2	21	95.5	9	100	1936	94.2
Full autopsy	6	0.4	112	18.8	1	4.5	0	-	119	5.8
Total	1428		596		22		9		2055	

The age distribution of autopsies for 2004 is shown in Table 2-3 and Figure 2-1. The mean age at autopsy for black men has increased annually from 37.9 years in 1998 to 44.5 years in 2004. The mean age of white men at autopsy (64.6 years) has remained essentially unchanged.

**TABLE 2-3 NUMBER AND PROPORTION OF AUTOPSIES BY AGE AND POPULATION GROUP (2004)**

Age group (years)	Black		White		Coloured		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
20-29	52	3.6	2	0.3	0	-	0	-	54	2.6
30-39	327	22.9	18	3.0	0	-	0	-	345	16.8
40-49	690	48.3	61	10.2	3	13.6	1	11.1	755	36.7
50-59	295	20.7	103	17.3	6	27.3	0	-	404	19.7
60-69	33	2.3	186	31.2	5	22.7	1	11.1	225	10.9
70-79	15	1.1	165	27.7	6	27.3	0	-	186	9.1
80+	4	0.3	61	10.2	2	9.1	0	-	67	3.3
Unknown	12	0.8	0	-	0	-	7	77.8	19	0.9
Total	1 428		596		22		9		2 055	



**FIG 2-1 DISTRIBUTION OF AUTOPSIES BY AGE AND POPULATION GROUP (2004)**

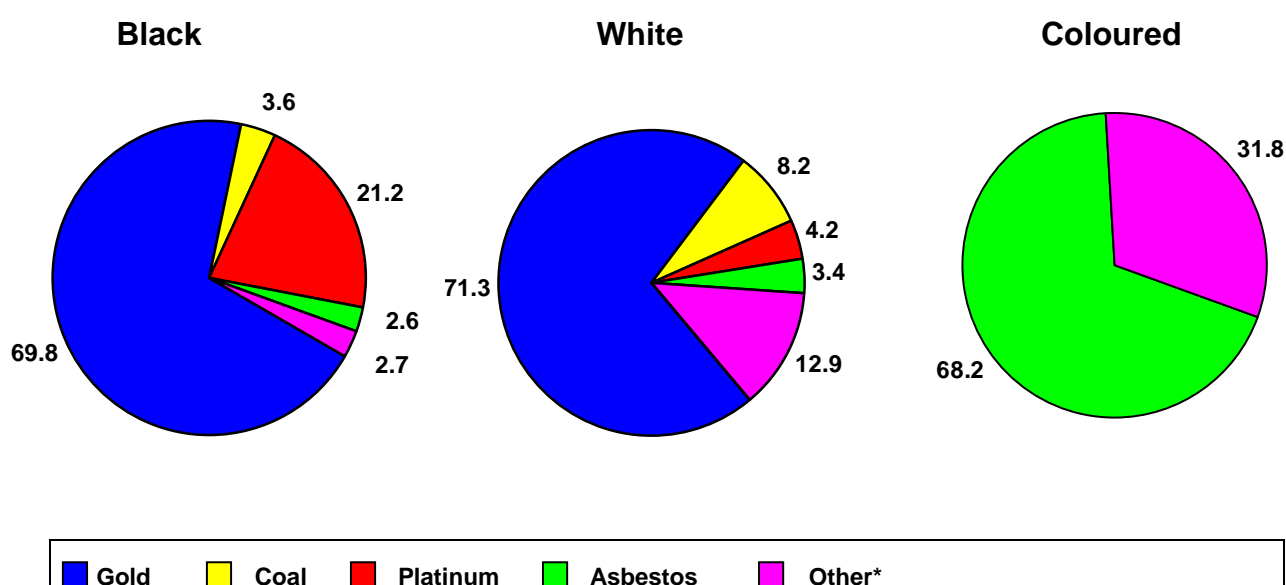
Table 2-4 and Figure 2-2 show the distribution of autopsies by commodity and population group for 2004. The percentage of autopsies received from the gold mining industry has been consistent over the last four years, at around 69%. The percentage of autopsies from platinum miners doubled from 8.3% in 1999 to 16.0% in 2004. As in previous years, the majority of coloured men who came to autopsy (68.2%) were asbestos miners.

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

**TABLE 2-4 NUMBER AND PROPORTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (2004)**

Commodity	Black		White		Coloured		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
Gold	997	69.8	425	71.3	0	-	1	11.1	1 423	69.2
Platinum	303	21.2	25	4.2	0	-	0	-	328	16.0
Coal	52	3.6	49	8.2	0	-	1	11.1	102	5.0
Asbestos	37	2.6	20	3.4	15	68.2	0	-	72	3.5
Iscor	1	0.1	19	3.2	0	-	0	-	20	1.0
Diamond	7	0.5	5	0.8	0	-	0	-	12	0.6
Copper	0	-	14	2.3	5	22.7	0	-	19	0.9
Manganese	8	0.6	3	0.5	0	-	0	-	11	0.5
Industry	4	0.3	9	1.5	0	-	0	-	13	0.6
Other	8	0.6	16	2.7	0	-	0	-	24	1.2
Unknown	11	0.8	11	1.8	2	9.1	7	77.8	31	1.5
Total	1428		596		22		9		2055	

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



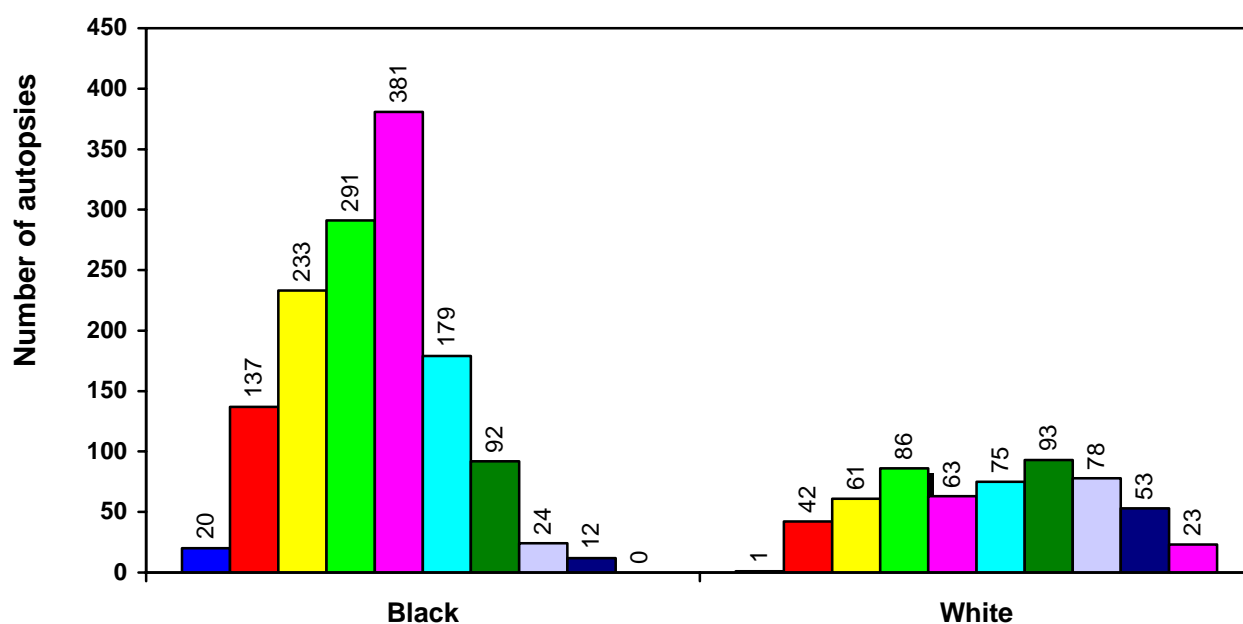
**FIG 2-2 DISTRIBUTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (2004)**

\* Includes Iscor, copper, diamond, quarry, silica (silicon smelters), manganese, zinc, minerals, steel, chrome, iron, manganese, emerald and other industries, as well as cases where no service histories were obtained.

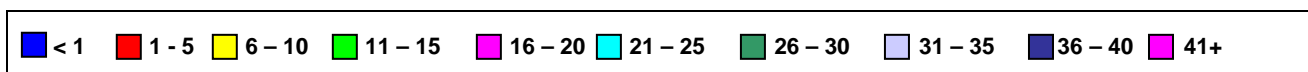
Detailed information about the years in mining service by population group is presented in Table 2-5 and Figure 2-3. In 2004, duration of service was obtained for all but 4.4% of the cases. This is much lower than previous years (e.g. 21.8% in 2003) and is attributable to improvement in the follow-up of cases to obtain complete service histories.

**TABLE 2-5 NUMBER AND PROPORTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (2004)**

Years of service	Black		White		Coloured		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
<1	20	1.4	1	0.2	0	-	0	-	21	1.0
1 - 5	137	9.6	42	7.0	5	22.7	0	-	184	9.0
6-10	233	16.3	61	10.2	2	9.1	0	-	296	14.4
11-15	291	20.4	86	14.4	1	4.5	0	-	378	18.4
16-20	381	26.7	63	10.6	2	9.1	0	-	446	21.7
21-25	179	12.5	75	12.6	1	4.5	0	-	255	12.4
26-30	92	6.4	93	15.6	3	13.6	1	11.1	189	9.2
31-35	24	1.7	78	13.1	2	9.1	0	-	104	5.1
36-40	12	0.8	53	8.9	2	9.1	0	-	67	3.3
41+	0	-	23	3.9	1	4.5	0	-	24	1.2
Unknown	59	4.1	21	3.5	3	13.6	8	88.9	91	4.4
Total	1 428		596		22		9		2 055	



Years of service:



**FIG 2-3 DISTRIBUTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (2004)**

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

**TABLE 2-6: MEAN AGE BY COMMODITY AND POPULATION GROUP (2004)**

Commodity	Black			White		
	N	Mean (years)	SD*	N	Mean (years)	SD*
Gold	989	44	8	425	64	13
Coal	52	45	9	49	66	14
Platinum	302	45	8	25	60	13
Asbestos	37	58	14	20	67	9
Diamond	7	54	8	5	71	14
Copper	0	-	-	14	67	9
Iscor	1	41	-	19	64	9
Other	20	51	12	28	64	11
Unknown	8	48	14	11	63	14
Total	1416	44	9	596	65	12

\* Standard deviation

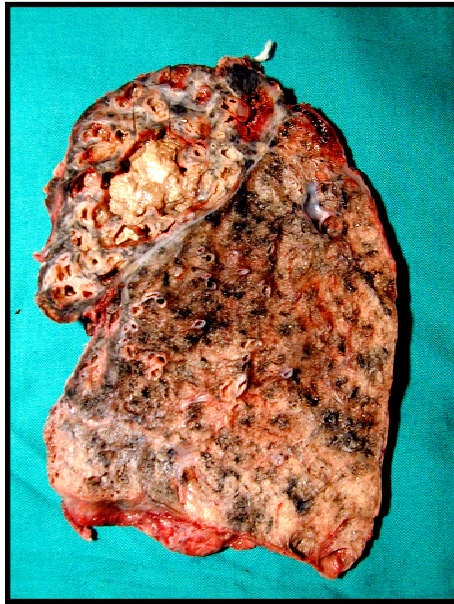
**TABLE 2-7: MEAN DURATION OF SERVICE BY COMMODITY AND POPULATION GROUP (2004)**

Commodity	Black			White		
	N	Mean (years)	SD*	N	Mean (years)	SD*
Gold	962	16	7	421	24	11
Coal	48	19	9	46	18	11
Platinum	297	15	8	24	17	8
Asbestos	35	10	10	19	13	11
Diamond	7	17	9	5	18	14
Copper	0	-	-	14	21	8
Iscor	1	14	-	19	23	10
Other	18	10	7	27	18	11
Unknown	1	36	-	0	-	-
Total	1369	16	8	575	22	11

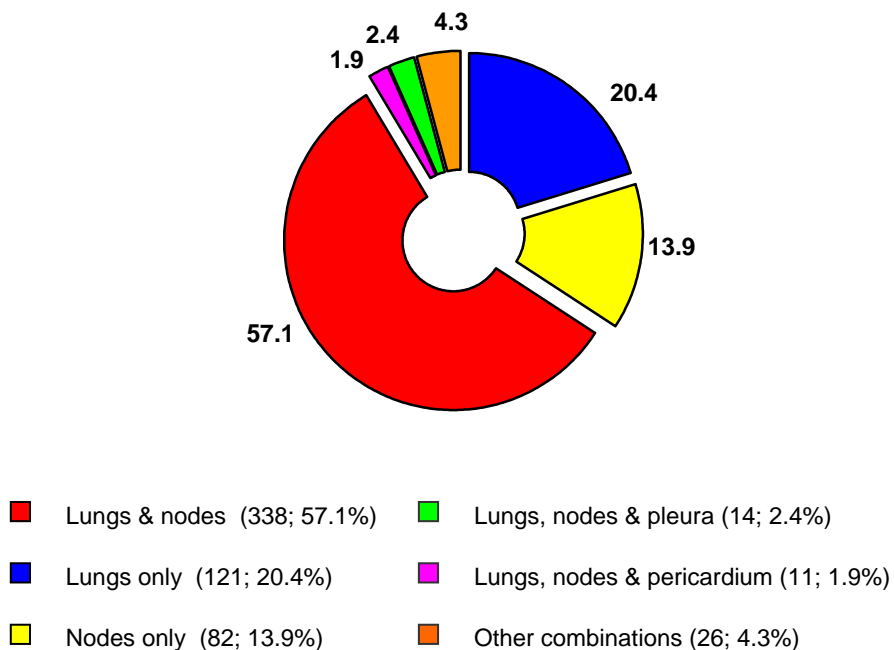
\*Standard deviation

### SECTION 3 – ACTIVE TUBERCULOSIS

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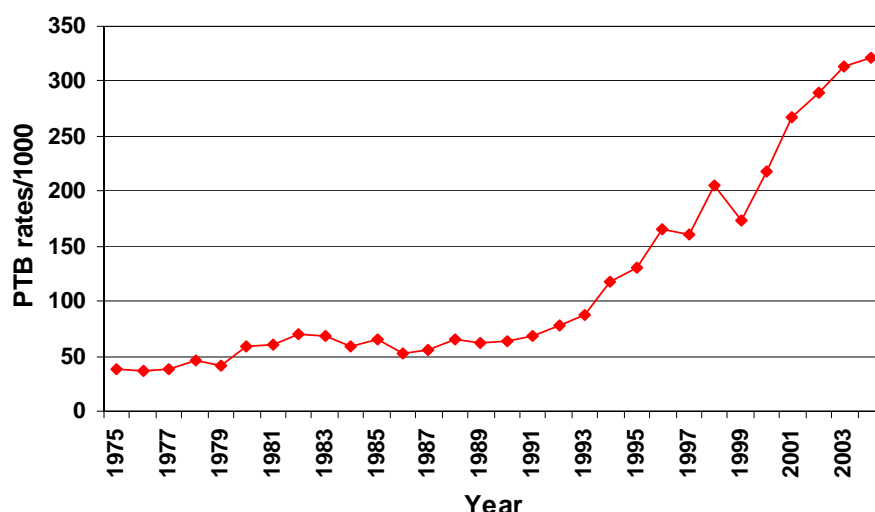


The distribution of active tuberculosis (TB) by anatomical site is presented in Figure 3-1 (n=592). Active pulmonary TB (PTB) was diagnosed in 23.9% (492) of all cases autopsied in 2004, compared to 16.4% (416) in 2000. Most of the men with PTB were black (93.5%; 460 cases), 5.7% (28 cases) were white, 0.4% (2 cases) were coloured and in 0.4% (2 cases) the population group was unknown.



**FIG 3-1 DISTRIBUTION OF ACTIVE TB BY SITE (2004)**

The overall rate of PTB (239/1000) has increased from 160/1000 in 2000. This is attributed to the increase in the PTB rate in black men from 217/1000 in 2000 to 322/1000 in 2004 (Fig 3.1). As indicated previously, cases are assigned to categories according to the commodity in which the most years of service occurred. In black gold miners, the rate of PTB has increased annually from 171/1000 in 1999 to 341 in 2004. Rates in black platinum miners have decreased in the last few years from 383/1000 in 2002 to 310/1000 in 2004.



**FIG 3-2 ACTIVE PTB RATES IN BLACK MINERS AT AUTOPSY (1975 to 2004)**

The distribution of active PTB cases by commodity is shown in Table 3-1. Rates in this and the following tables are expressed per 1000. The majority of active PTB cases (72.8%) came from the gold mining industry (69.2% of all autopsy cases came from that commodity).

**TABLE 3-1 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY COMMODITY AND POPULATION GROUP (2004)**

Commodity	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	340	341	18	42	0	-	0	-	358	252
Platinum	94	310	3	120	0	-	0	-	97	296
Coal	11	212	3	61	0	-	1	1000	15	147
Asbestos	6	162	3	150	1	67	0	-	10	139
Diamond	1		0		0		0		1	
Copper	0		1		1		0		2	
Other	3		0		0		0		3	
Unknown	5		0		0		1		6	
<b>Total</b>	<b>460</b>	<b>322</b>	<b>28</b>	<b>47</b>	<b>2</b>	<b>91</b>	<b>2</b>	<b>222</b>	<b>492</b>	<b>239</b>

Note: rates have not been calculated where numbers are small

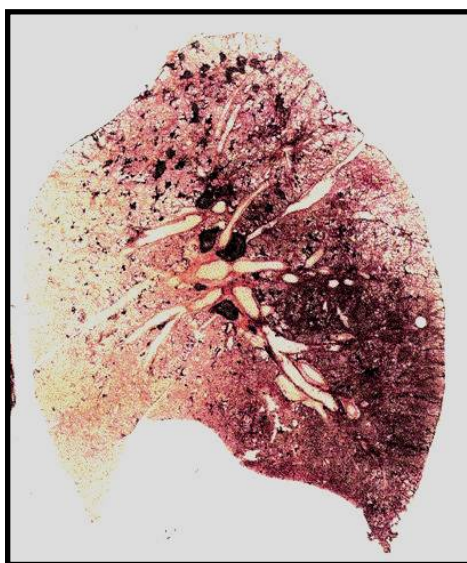
The age distribution of cases with active PTB is shown in Table 3-2. Most (48.2%; 237 cases) were in the age group 40-49 years, followed by 22.8% (112 cases) in the 30-39 year age group.

**TABLE 3-2 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY AGE AND POPULATION GROUP (2004)**

Age group (years)	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	14	269	0	-	0	-	0	-	14	259
30-39	111	339	1	56	0	-	0	-	112	325
40-49	232	336	5	82	1	333	0	-	237	314
50-59	86	292	10	97	0	-	0	-	97	240
60-69	8	242	8	43	0	-	1	1000	17	76
70-79	4	267	4	24	1	167	0	-	9	48
Unknown	5	417	0	-	0	-	1	143	6	316
<b>Total</b>	460	322	28	47	2	91	2	222	492	239



## SECTION 4 – SILICOSIS



Silicotic nodules were found in the lungs of 432 cases (21.0% of all autopsies), 91.2% of which came from the gold mining industry. Of all cases of silicosis, occasional silicotic nodules were found in 55.8% of cases, a few in 17.8%, a moderate number in 22.9% and a large number in 2.3%.

The distribution of cases with silicosis by commodity and population group is presented in Table 4-1. The rate of silicosis in gold miners has increased from 191/1000 in 2000 to 277/1000 in 2004.

**TABLE 4-1 NUMBER OF CASES AND PREVALENCE OF SILICOSIS BY COMMODITY AND POPULATION GROUP (2004)**

Commodity	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	305	306	89	209	0	-	0	-	394	277
Platinum	15	50	3	120	0	-	0	-	18	55
Coal	6	115	5	102	0	-	0	-	11	108
Asbestos	1		0		0		0		1	
Diamond	1		0		0		0		1	
Copper	0		4		0		0		4	
Unknown	1		2		0		0		3	
<b>Total</b>	<b>329</b>	<b>230</b>	<b>103</b>	<b>173</b>	<b>0</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>432</b>	<b>210</b>

Note: rates have not been calculated where numbers are small

Although the silicosis rates increased with increasing age in both black and white men, the age distribution of cases with silicosis differed between the two population groups (Table 4-2). Silicosis was diagnosed in blacks at younger ages (<40) and in men who were exposed to silica for fewer years (< 5 years) (Table 4-3).

**TABLE 4-2 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLD MINING INDUSTRY, BY AGE AND POPULATION GROUP (2004)**

Age group (years)	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	1	29	0	-	-	-	0	-	1	29
30-39	27	105	0	-	-	-	0	-	27	99
40-49	186	377	7	140	-	-	0	-	193	355
50-59	77	418	8	118	-	-	0	-	85	337
60-69	10	667	28	226	-	-	0	-	38	273
70-79	1	250	32	271	-	-	0	-	33	270
80+	1	333	14	292	-	-	0	-	15	294
Unknown	2	250	0	-	-	-	0	-	2	222
Total	305	306	89	209	0	-	0	-	394	277

**TABLE 4-3 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLD MINING INDUSTRY, BY YEARS OF SERVICE AND POPULATION GROUP (2004)**

Years of service	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
1 - 5	12	162	0	-	0	-	0	-	12	121
6-10	28	159	5	152	0	-	0	-	33	158
11-15	57	264	11	190	0	-	0	-	68	248
16-20	101	357	5	106	0	-	0	-	106	321
21-25	52	433	12	214	0	-	0	-	64	364
26-30	35	583	20	294	0	-	0	-	55	430
31-35	8	444	17	258	0	-	0	-	25	298
36-40	3	333	12	261	0	-	0	-	15	273
41+	0	-	7	318	0	-	0	-	7	318
Unknown	9	257	0	-	0	-	0	-	9	225
Total	305	306	89	209	0	-	0	-	394	277

## SECTION 5 – OTHER PNEUMOCONIOSES

### MASSIVE FIBROSIS

There were 29 (1.4%) cases of massive fibrosis (25 black, 4 white). Twenty six were from the gold mining industry.

### COAL WORKERS' PNEUMOCONIOSIS

There were 15 (0.7%) cases of coal workers' pneumoconiosis.

### MIXED DUST PNEUMOCONIOSIS

There were 6 (0.3%) cases of mixed dust pneumoconiosis.

### ASBESTOSIS AND PLEURAL PLAQUES

There were 51 cases of asbestosis of which 58.8% (n=30) had slight, 33.3% (n=17) moderate and 7.8% (n=4) marked fibrosis. Thirty seven of these cases had worked in the asbestos mining industry at some time in their lives.

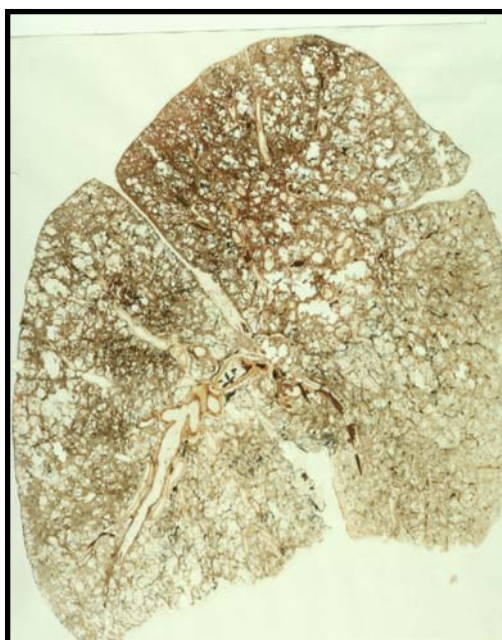
Only 13 cases had asbestos plaques. However, the parietal pleura (the site where plaque formation usually occurs) is seldom submitted with the lungs.

The distribution of asbestosis by age and population group is shown in Table 5-1. No asbestosis was diagnosed in cases younger than 40 years of age.

**TABLE 5-1 NUMBER OF CASES AND PREVALENCE OF ASBESTOSIS BY AGE AND POPULATION GROUP (2004)**

Age group (years)	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
40-49	6	9	1	16	0	-	0	-	7	9
50-59	8	27	0	-	0	-	0	-	8	20
60-69	7	212	9	48	2	400	0	-	18	80
70-79	6	400	4	24	3	500	0	-	13	70
80+	1	250	1	16	2	1000	0	-	4	60
Unknown	0	-	0	-	0	-	1	143	1	53
Total	28	20	15	25	7	318	1	111	51	25

## SECTION 6 – EMPHYSEMA



There were 434 cases of emphysema, the extent of which was mild in 81.8% (n=355), moderate in 17.1% (n=74) and marked in 1.2% (n=5). The distribution of emphysema by age and population group is presented in Table 6-1.

**TABLE 6-1 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY AGE AND POPULATION GROUP (2004)**

Age group (years)	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	1	19	0	-	0	-	0	-	1	19
30-39	11	34	0	-	0	-	0	-	11	32
40-49	92	133	10	164	0	-	1	1000	103	136
50-59	52	176	26	252	3	500	0	-	81	200
60-69	17	515	93	500	5	1000	1	1000	116	516
70-79	7	467	78	473	3	500	0	-	88	473
80+	2	500	29	475	1	500	0	-	32	478
Unknown	0	-	0	-	0	-	2	286	2	105
Total	182	127	236	396	12	545	4	444	434	211

The majority of black and white men with emphysema were from the gold mining industry (65.9%, n=286) (Table 6-2).

**TABLE 6-2 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY COMMODITY AND POPULATION GROUP (2004)**

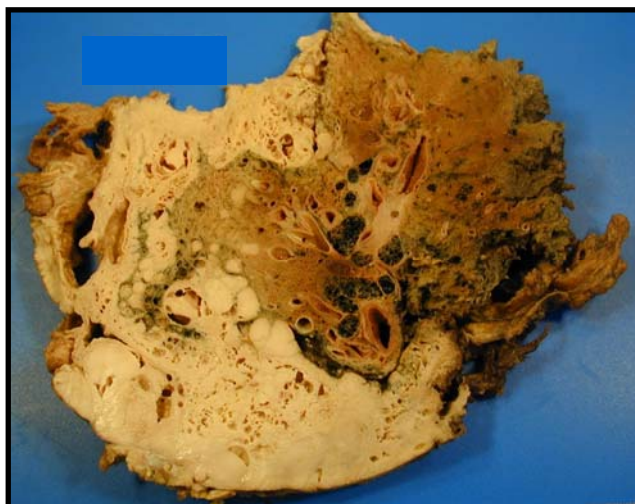
Commodity	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	111	111	175	412	0	-	0	-	286	201
Platinum	28	92	7	280	0	-	0	-	35	107
Coal	21	404	21	429	0	-	1	-	43	422
Asbestos	16	432	7	350	6	400	0	-	29	403
Isacor	0		6		0		0		6	
Copper	0		4		4		0		8	
Diamond	1		3		0		0		4	
Other	3		10		0		0		13	
Unknown	2		3		2		3		10	
Total	182	127	236	396	12	545	4	444	434	211

Note: rates have not been calculated where numbers are small

**TABLE 6-3 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY YEARS OF SERVICE AND POPULATION GROUP (2004)**

Years of service	Black		White		Coloured		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
<1	2	100	1	1000	0	-	0	-	3	143
1 - 5	17	124	13	310	2	400	0	-	32	174
6-10	25	107	19	311	1	500	0	-	45	152
11-15	30	103	37	430	1	1000	0	-	68	180
16-20	43	113	23	365	0	-	0	-	66	148
21-25	30	168	28	373	0	-	0	-	58	227
26-30	16	174	44	473	2	667	1	1000	63	333
31-35	7	292	31	397	1	500	0	-	39	375
36-40	3	250	24	453	1	500	0	-	28	418
41+	0	-	11	478	1	1000	0	-	12	500
Unknown	9	153	5	238	3	1000	3	375	20	220
Total	182	127	236	396	12	545	4	444	434	211

## SECTION 7 – MESOTHELIOMA



The number of cases of mesothelioma in 2004 (n=25) was comparable to that in previous years (14 in 2000, 17 in 2001, 25 in 2002 and 36 in 2003).

**TABLE 7-1 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY AGE AND POPULATION GROUP (2004)**

Age group (years)	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
40-49	2	20	1	8	0	-	3	12
50-59	3	30	2	15	1	50	6	24
60-69	2	20	6	46	0	-	8	32
70-79	2	20	3	23	1	50	6	24
80+	1	10	1	8	0	-	2	8
Total	10		13		2		25	

The distribution of mesothelioma by commodity and population group is presented in Table 7.2. Forty eight percent of the miners had worked in asbestos mining at some stage in their careers.

**TABLE 7-2 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY COMMODITY AND POPULATION GROUP (2004)**

Commodity	Black		White		Coloured		Total	
	N	%	N	%	N	%	N	%
Asbestos	6	60	2	15	2	100	10	40
Gold	1	10	7	54	0	-	8	32
Platinum	2	20	0	-	0	-	2	8
Coal	0	-	1	8	0	-	1	4
Other	0	-	2	15	0	-	2	8
Unknown	1	10	1	8	0	-	2	8
Total	10		13		2		25	

## SECTION 8 – PRIMARY LUNG CANCER

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Eighty five cases of primary lung cancer were found at autopsy, 25.9% of which were in black, 69.4% in white and 4.7% in coloured men. Most of the cases were large cell lung carcinomas (30.6%; n = 26), followed by squamous cell type (23.5%; n = 20), small cell type and adenocarcinomas (22.3%; n = 19 each). One case of bronchoalveolar carcinoma was diagnosed.

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

**TABLE 8-1 NUMBERS OF CASES AND PREVALENCE OF PRIMARY LUNG CANCER BY AGE AND POPULATION GROUP (2004)**

Age group (years)	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
40-49	8	12	3	49	0	-	11	15
50-59	11	37	12	117	2	333	25	62
60-69	3	91	22	118	1	200	26	116
70-79	0	-	17	103	1	167	18	97
80+	0	-	5	82	0	-	5	75
Unknown	0	-	0	-	0	-	0	0
Total	22	15	59	99	4	182	85	41



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

**TABLE 8-2 NUMBER OF CASES AND PREVALENCE OF PRIMARY LUNG CANCER BY COMMODITY AND POPULATION GROUP (2004)**

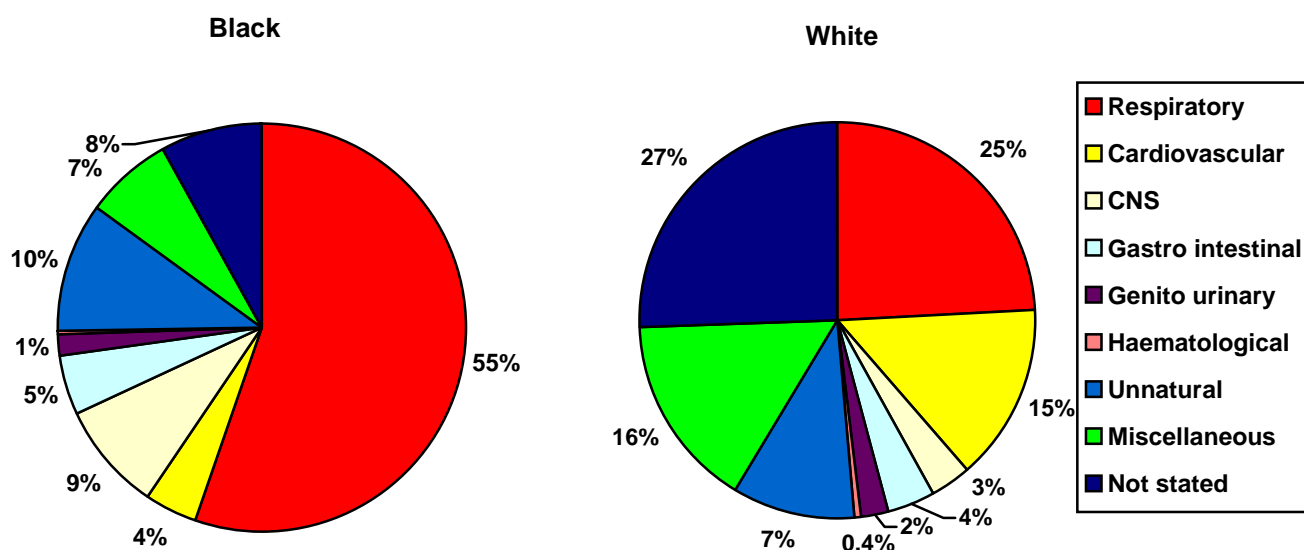
Commodity	Black		White		Coloured		Total	
	N	Rate	N	Rate	N	Rate	N	Rate
Gold	9	9	36	85	0	-	45	32
Platinum	4	13	5	200	0	-	9	27
Coal	2	38	7	143	0	-	9	88
Asbestos	5	135	2	100	1	67	8	111
Iscor	0		1		0		1	
Copper	0		1		1		2	
Diamond	0		1		0		1	
Other	2		4		0		6	
Unknown	0		2		2		4	
Total	22	15	59	99	4	182	85	41

## SECTION 9 – CLINICAL CAUSES OF DEATH

Table 9-1 and Figure 9-1 show the clinical cause of death stated in the accompanying documents submitted with the cardio-respiratory organs, by population group. Diseases of the respiratory system were the most frequent (46.5%) overall. Black men had the highest proportion of unnatural causes of death (10.2%). The proportion of unnatural deaths in black men decreased from 12.2% in 2003 to 10.2% in 2004. In 13.9% of all cases the cause of death was not stated.

**TABLE 9-1 CLINICAL CAUSES OF DEATH BY POPULATION GROUP (2004)**

System	Black		White		Coloured		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
Respiratory	789	55.3	150	25.2	12	54.5	2	22.2	953	46.5
Cardio-vascular	60	4.2	89	14.9	3	13.6	0	-	152	7.4
Central Nervous System	124	8.7	20	3.4	0	-	0	-	144	7.0
Gastro intestinal	68	4.8	24	4.0	0	-	0	-	92	4.5
Genito urinary	21	1.5	15	2.5	0	-	0	-	36	1.8
Haematological	6	0.4	3	0.5	0	-	0	-	9	0.4
Unnatural	145	10.2	39	6.5	1	4.5	0	-	185	9.0
Miscellaneous	98	6.9	97	16.3	3	13.6	0	-	198	9.6
Not stated	117	8.2	159	26.7	3	13.6	7	77.8	286	13.9
<b>Total</b>	<b>1428</b>		<b>596</b>		<b>22</b>		<b>9</b>		<b>2055</b>	



**FIGURE 9-1 CLINICAL CAUSE OF DEATH AS GIVEN BY THE CLINICIANS WHO SUBMIT THE ORGANS TO THE NIOH (2004)**

**APPENDIX 1: DISTRIBUTION OF AUTOPSIES ACCORDING TO THE LAST MINE WHERE THE DECEASED WORKED (2004)**

Commodity	Last mine worked	Black	White	Coloured	Unknown	Total
<b>Asbestos</b>	African Chrysolite Asbestos		1			1
	Asbestos Mine		3	1		4
	Blackrich Asbestos			1		1
	Cape Blue		1	4		5
	Danielskuil Asbestos mine	2	1	1		4
	Everite		2			2
	Gefco	33	4	2		39
	Havelock Asbestos Mine		1			1
	Koegas	1	3	6		10
	Penge Asbestos		4			4
	Pomfret Asbestos Mine	1				1
	Wandrag Asbestos Mine	2				2
<b>Total from asbestos mines</b>		<b>39</b>	<b>20</b>	<b>15</b>		<b>74</b>
<b>Chrome</b>	Dikolong Chrome Mine	2				2
	Eastern Chrome Mine		1			1
	Montrose Chrome Mine		1			1
	Samancor Western Chrome	1	2			3
<b>Total from chrome mines</b>		<b>3</b>	<b>4</b>			<b>7</b>
<b>Coal</b>	Alpha Anthracite Colliery		1			1
	Arnot Colliery	5	1			6
	Bank Colliery	2	1			3
	Barbrook Colliery		1			1
	Blinkpan Colliery		2			2
	Cornelia Colliery		1			1
	Coronation Colliery		2			2
	Delmas Colliery		1			1
	Douglas Colliery	1	4			5
	Duiker Colliery		2			2
	Durnacol Mine		1			1
	Duvha Opencast		1			1
	Ermelo Coal		3			3
	Gloria Colliery	2				2
	Goedehoop Colliery	3				3
	Greenside Colliery	3				3
	Kilbarchen Colliery		1		1	2
	Kleinkopje Colliery	6				6
	Koornfontein Coal	1				1
	Kriel Colliery	4				4
	Landau Colliery	2				2
	Matla Coal	12	2			14
	New Clydesdale Colliery	1				1
	New Denmark	2				2
	New Largo Colliery		1			1
	Optimum Colliery		2			2
	Rietspruit Colliery		1			1
	Sasol Coal Mine	3	3			6
	S A Coal Estates		2			2
	Savemore Colliery	4	1			5
	Secunda Colliery		4			4
	Springbok Colliery		4			4
	Springfield Colliery		2			2

Commodity	Last mine worked	Black	White	Coloured	Unknown	Total
<b>Coal (continued)</b>	Springlake Colliery		1			1
	Tavistok Colliery		1			1
	Twistdraai		1			1
	Usutu Colliery		1			1
	Van Dyk's Drift	1	1			2
	Vierfontein Colliery		1			1
	Witbank Collieries	1	3			4
<b>Total from coal mines</b>		<b>53</b>	<b>53</b>		<b>1</b>	<b>107</b>
<b>Copper</b>	Copper Mine		2			2
	Messina Copper		2			2
	O'Kiep Copper		3	3		6
	Prieska	1	4	2		7
<b>Total from copper mines</b>		<b>1</b>	<b>11</b>	<b>5</b>		<b>17</b>
<b>Diamond</b>	Cullinan Diamond Mine		2			2
	De Beers Consolidated	5				5
	Diamond Mine		1			1
	Loxton Exploration	1				1
	Premier Diamond	1	3			4
	Rex Diamond Mine	1				1
	Star Diamond		1			1
	Zaaiman Diamond Mine		1			1
<b>Total from diamond mines</b>		<b>8</b>	<b>8</b>			<b>16</b>
<b>Gold</b>	African Rainbow Minerals & Exploration	9	1			10
	Angilon GM	1				1
	Anglo American GM		1			1
	Anglogold Business Service	4	2			6
	Anglogold Great Noligwa GM	17				17
	Anglogold Health Service (Free State)	1				1
	Anglogold Metallurgy	3				3
	Anglogold Vaal River Operation	15				15
	Bambanani GM	27	2			29
	Bankfontein GM	1				1
	Barberton GM		1			1
	Beatrix Gold	62	3			65
	Blyvoorquizicht	2	17			19
	Bracken Mines		5			5
	Brakpan GM	1				1
	Buffelsfontein Gold	11	14			25
	Cementation		2			2
	Consort GM		1			1
	Crown Mines		1			1
	Deelkraal		5			5
	Doornfontein	3	7			10
	Driefontein Cons GM	81	4			85
	Duff Scott Memorial Hospital	1				1
	Durban Roodepoort Deep	1	11			12
	East Champ GM		1			1
	East Driefontein	19	10			29

Commodity	Last mine worked	Black	White	Coloured	Unknown	Total
<b>Gold (continued)</b>	East Geduld	1				1
	East Rand Prop	5	18			23
	Elandsrand		4			4
	Evander GM	35	3			38
	Freddies Gold	4	2			6
	Free State Geduld	3	13			16
	Free State Saaiplaas		3			3
	Gencor	1				1
	Goldfields	3	1			4
	Grootvlei Prop	3	7			10
	Harmony	56	23			79
	Hartebeesfontein	44	19			63
	J.I.C. Gold Mine	17	2			19
	Joel	6	3			9
	Kinross	12	3			15
	Kloof	77	13			90
	Kopanang GM	17				17
	Leeudoorn	2	4			6
	Leslie	1	1			2
	Libanon	2	8			10
	Lorraine		5			5
	Luipaardsvlei Estate GM		1			1
	Masimong Gold Mine	23				23
	Matjabeng Gold Mine	17	2			19
	Merriespruit GM	9				9
	Middelburg GM	1				1
	Moab Khotso GM	1				1
	New Kleinfontein GM		1			1
	Nigel GM	1	2			3
	Oryx	25	2			27
	Placer Dome GM	22	1			23
	President Brand	6	4			10
	President Steyn	7	11			18
	Randfontein	16	15			31
	Robinson Gold Mine		1			1
	Roodekop GM		1			1
	S A Land		1			1
	Sallies	1				1
	SAMAT GM		1			1
	Simmer & Jack GM		2			2
	South Deep GM		1			1
	South Roodepoort		2			2
	St Helena	21	2			23
	Stilfontein	1	8			9
	Tautona GM		2			2
	Target Gold Mine	1	1			2
	Tshepone GM	15				15
	Ubuntu Small Scale GM	4				4
	Unisel GM	5				5
	Vaal Reefs	145	33			178
	Ventersport	1	7			8
	Vlakfontein		1			1
	Waterpan GM	1	3			4
	Welkom GM	2	8			10
	West Driefontein	11	9			20
	West Rand Consolidation	0	6			6

Commodity	Last mine worked	Black	White	Coloured	Unknown	Total
<b>Gold (continued)</b>	Western Areas	3	10			13
	Western Deep Levels	70	27			97
	Western Holdings	2	9			11
	Western Reef GM		3			3
	Winkelhaak	3				3
	Wit Nigel GM		1			1
<b>Total from gold mines</b>		<b>962</b>	<b>398</b>			<b>1360</b>
<b>Platinum</b>	Amandlabult Platinum (Rustenburg)	1				1
	Anglo Platinum Mine	1				1
	Atok Platinum	4				4
	Bafokeng	1				1
	Deilmann Haniel SA (Northam)	6				6
	Impala Platinum	118	10			128
	Karee Platinum	2	1			3
	Lebowa Platinum	2				2
	Northam Platinum	34	2			36
	Rustenburg Platinum	159	20			179
	Swartklip Platinum		1			1
	Western Platinum		1			1
	Wildebeestfontein	2				2
	Zondereinde Platinum	2	1			3
<b>Total from platinum mines</b>		<b>331</b>	<b>37</b>			<b>368</b>
<b>Emerald</b>	Gravelotte		1			1
<b>Iron</b>	Iron Ore Mine		1			1
<b>Iron &amp; Manganese</b>	Associated Manganese	3	2			5
<b>Manganese</b>	Hotazel Manganese Mine	2	1			3
	Manganese Mine		1			1
	S A Manganese	1	2			3
<b>Lead &amp; Minerals</b>	Blackmountain		2			2
<b>Phosphate</b>	Foskor Beperk		1			1
<b>Quarries</b>	Hippo Quarries		1			1
	Quarry Mine		1			1
	Bon Accord Quarry	6	2			8
<b>Total from quarries</b>		<b>6</b>	<b>4</b>			<b>10</b>
<b>Silica</b>	Silicon Smelters	2				2
<b>Sinkers</b>	Shaft Sinkers	1				1
<b>Steel &amp; Iron</b>	Iscor	1	28			29
<b>Zinc</b>	Zinc Corporation		1			1
<b>Non-Miner</b>	Industry	3	7			10
	NCOH (NIOH)	1				1
	Non-miner	1	1			2
	Transnet		2			2
<b>Unknown</b>	Unknown	10	9	2	7	28
<b>TOTAL</b>		<b>1428</b>	<b>596</b>	<b>22</b>	<b>9</b>	<b>2 055</b>

## **APPENDIX 2: PATHAUT PUBLICATIONS AND ACTIVITIES (2004)**

### **Journal articles**

Published:

Gerston KF, Blumberg L, Tshabalala VA and Murray J. Viability of mycobacteria in formalin-fixed lungs. *Human Pathology* 2004; 35: 571-575.

Murray J, G Candy, Nelson G and Ndlovu N . Occupational disease rates in South African miners at autopsy: Surveillance report 2003. *Occupational Health SA* 2004;10 (6):16-17.

Murray J, Back P and Nelson G. Pulmonary nocardiosis in autopsies of South African miners. *The Southern African Journal of Epidemiology and Infection* 2004;19(2): 60-62.

Murray J and Nelson G. Demographic data and disease rates in deceased South African miners. *Occupational Health SA* 2004: 10(1):16.

In press:

Murray J, Nelson G, Ndlovu N, Ross M, Shearer S and Barnes D. Occupational diseases in South African miners. Letter to the editor (in press December 2004)

Submitted:

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