



**NATIONAL HEALTH  
LABORATORY SERVICE**

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

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## **Pathology Division Surveillance Report**

### **Demographic Data and Disease Rates for January to December 2014**

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**NIOH Pathology Report 1/2015**

[http://www.nioh.ac.za/?page=pathology\\_disease\\_surveillance\\_reports&id=162](http://www.nioh.ac.za/?page=pathology_disease_surveillance_reports&id=162)

## **ACKNOWLEDGEMENTS**

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

Anna Khumalo  
Busisiwe Mkhonza  
Dan Afrika  
Estelle Garton  
Goodman Rani  
Jim Phillips  
Joseph Mukovhi  
Juliet Buthelezi  
Patrick Mbhontsi  
Palesa Mothei  
Peter Masilo  
Rosina Soko  
Wilson Mashele

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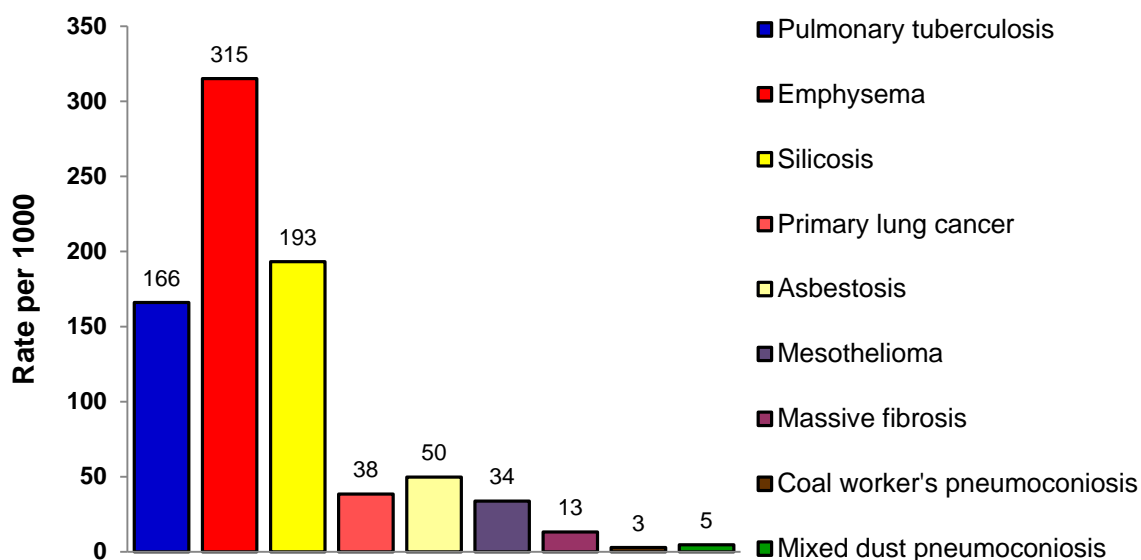
ISSN 1812-7681

## EXECUTIVE SUMMARY

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During 2014, 1 066 deceased cases were examined at the NIOH. Of these, 58.8% were black, 40.5% were white, 0.5% were coloured, 0.1% were Indian and 0.1% were submitted without information on population group. Of the cases submitted, 49.7 % (n=530) were ex-miners, 49.1% (n=523) current miners and 1.2% (n=13) cases could not be classified.

The overall disease rates (per 1000 autopsies) for 2014 are shown in Figure 1.



**FIG.1 OVERALL DISEASE RATES FOR 2014**

The overall rate of pulmonary tuberculosis (PTB) decreased from (192/1000) in 2013 to (166/1000) in 2014. The rate in black gold miners decreased from 322/1000 in 2013 to 305/1000 in 2014. In black platinum miners, the PTB rate increased from 199/1000 in 2013 to 242/1000 in 2014.

The overall silicosis rate in 2014 (193/1000) was lower than that in 2013 (232/1000). The rate in black gold miners, increased from 361/1000 in 2013 to 374/1000 in 2014.

Forty nine women came to autopsy in 2014, 30.6% (n=15) of whom had diseases related to asbestos exposure.

Some cases were received with incomplete exposure information. The type (commodity), duration of service and last mine worked were not provided for 12 (1.1%), 59 (5.5%) and 12 (1.1%) of the cases, respectively.

Since 2010, the province or foreign country from which the organs were sent has been recorded on the PATHAUT database. Table 1 shows the distribution of cases by province or country and population group. Most cases originated from the North West (33.5%), Gauteng (24.8%) and Free State (19.0%) provinces. One case was received from Botswana and another was received from Namibia. There were no cases from Lesotho.

**TABLE 1-1 DISTRIBUTION OF AUTOPSY CASES BY PROVINCE/COUNTRY AND POPULATION GROUP (2014)**

Province or country	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Botswana	1	0.2	0	-	0	-	0	-	0	-	1	0.1
Eastern Cape	13	2.1	0	-	0	-	0	-	0	-	13	1.2
Free State	154	24.5	49	11.3	0	-	0	-	0	-	203	19.0
Gauteng	55	8.7	208	48.1	1	20.0	0	-	0	-	264	24.8
Kwazulu-Natal	0	-	10	2.3	0	-	0	-	0	-	10	0.9
Limpopo	5	0.8	11	2.5	0	-	0	-	1	100.0	17	1.6
Mpumalanga	38	6.0	39	9.0	0	-	1	100.0	0	-	78	7.3
Namibia	0	-	1	0.2	0	-	0	-	0	-	1	0.1
Northern Cape	101	16.1	15	3.5	2	40.0	0	-	0	-	118	11.1
North West	260	41.3	95	22.0	2	40.0	0	-	0	-	357	33.5
Western Cape	0	-	4	0.9	0	-	0	-	0	-	4	0.4
<b>Total</b>	<b>627</b>		<b>432</b>		<b>5</b>		<b>1</b>		<b>1</b>		<b>1 066</b>	

In recent years, the Pathology Division has scaled down its outreach activities (Appendix 2).

Three journal articles using autopsy data were published and research findings were presented at several fora (Appendix 2). There are two ongoing PhD studies (University of the Witwatersrand) utilising the PATHAUT data.

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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 1cm 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 dust pneumoconiosis</b>	Lung fibrosis caused by simultaneous exposure to multiple dust types
<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 adverse health outcomes
<b>Environmental asbestos exposure</b>	Non-occupational asbestos exposure. Such cases are examined at the NIOH but are not submitted to the MBOD for compensation.

## 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 v9.3.

This report describes autopsy cases examined during the year 2014. Some of the earlier reports and this report can be accessed at [http://www.nioh.ac.za/publications/publications\\_pathaut\\_reports.htm](http://www.nioh.ac.za/publications/publications_pathaut_reports.htm).

Throughout this report, the term 'men' and all data refers to both men and women, with the exception of Section 10 which reports findings in women only.

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 numbers of autopsies performed annually since 1975 are presented in Table 2-1.

**TABLE 2-1 DISTRIBUTION OF AUTOPSIES BY YEAR AND POPULATION GROUP  
(1975 - 2014)**

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			1		3 659
1983	2 096	65	1 109	34	41	1					3 246
1984	1 966	64	1 098	36	28	1					3 092
1985	2 275	64	1 200	34	66	2					3 541
1986	2 456	68	1 125	31	45	1					3 626
1987	2 594	68	1 168	30	78	2					3 840
1988	2 518	67	1 165	31	77	2					3 760
1989	2 138	65	1 090	33	60	2					3 288
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			12	0.3	4 003
1996	2 154	67	960	30	56	2			69	2.1	3 239
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
2005	1 274	68	562	30	22	1			18	1	1 876
2006	1 165	68	535	31	11	1			9	0.5	1 720
2007	1 144	66	539	31	21	1			20	1.2	1 724
2008	1 185	69	556	32	11	1			48	2.7	1 800
2009	1 138	68	500	29	16	1			8	0.5	1 662
2010	960	64	521	35	15	1			6	0.4	1 502
2011	847	64	453	34	11	1			18	1.4	1 329
2012	706	61	445	38	7	1			6	0.5	1 164
2013	744	63	421	35	7	1			16	1	1 188
2014	627	59	432	41	5	1	1		1		1 066
<b>Total</b>	<b>72 959</b>	<b>66</b>	<b>35 219</b>	<b>32</b>	<b>1 611</b>	<b>1</b>	<b>4</b>		<b>349</b>		<b>110 142</b>

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 131 591 in 2014.

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 2014. Autopsies of the cardio-respiratory organs only comprised 96.2% of all examinations.

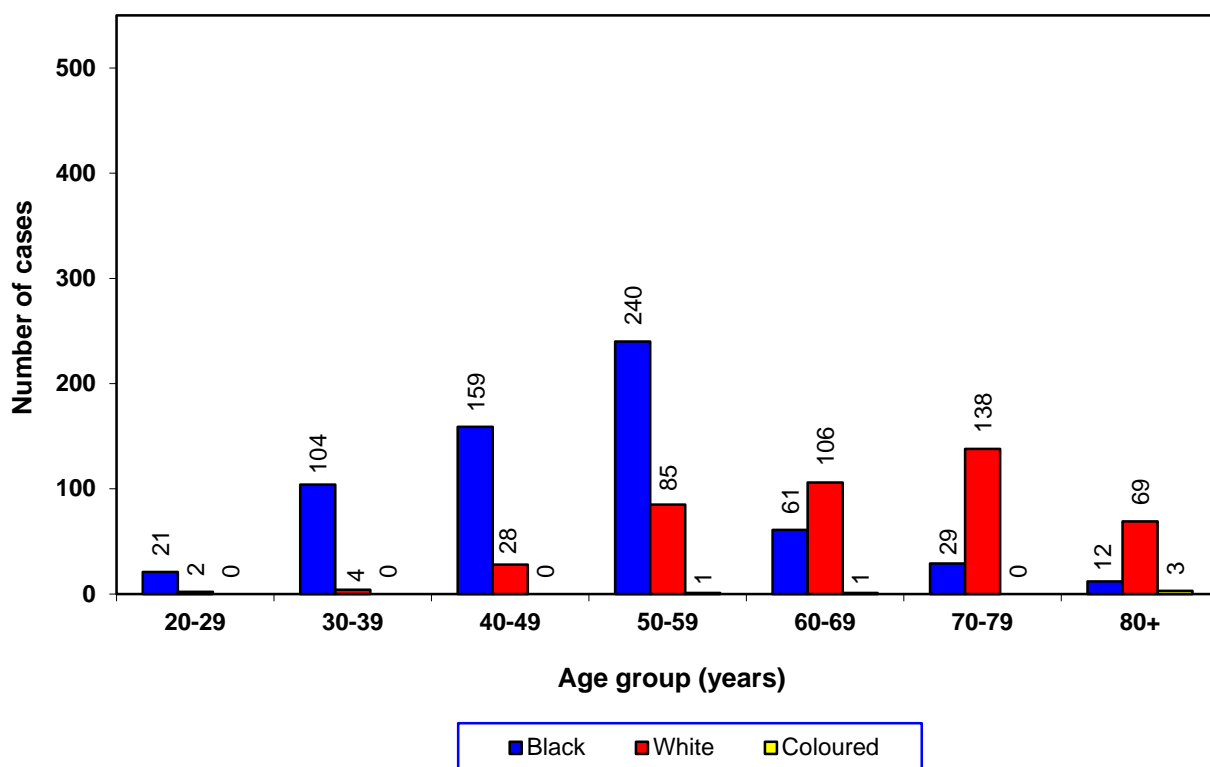
**TABLE 2-2 NUMBER AND PROPORTION OF AUTOPSIES BY TYPE AND POPULATION GROUP (2014)**

Autopsy type	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Cardio-respiratory organs only	627	100.0	393	91.0	4	80.0	1	100.0	1	100.0	1 026	96.2
Full autopsy	0	-	39	9.0	1	20.0	0	-	0	-	40	3.8
Total	627		432		5		1		1		1 066	

The age distribution of cases for 2014 is shown in Table 2-3 and Figure 2-1. The mean age at autopsy of black men was 50.1 years, similar to that in 2013 (49.5 years). The mean age of white men at autopsy was 67.1 years in 2014, similar to 68.1 years in 2013.

**TABLE 2-3 NUMBER AND PROPORTION OF AUTOPSIES BY AGE AND POPULATION GROUP (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
20-29	21	3.3	2	0.5	0	-	0	-	0	-	23	2.2
30-39	104	16.6	4	0.9	0	-	0	-	0	-	108	10.1
40-49	159	25.4	28	6.5	0	-	0	-	0	-	187	17.5
50-59	240	38.3	85	19.7	1	20.0	1	100.0	0	-	327	30.7
60-69	61	9.7	106	24.5	1	20.0	0	-	0	-	168	15.8
70-79	29	4.6	138	31.9	0	-	0	-	0	-	167	15.7
80+	12	1.9	69	16.0	3	60.0	0	-	0	-	84	7.9
Unknown	1	0.2	0	-	0	-	0	-	1	100.0	2	0.2
Total	627		432		5		1		1		1 066	



**FIG 2-1 DISTRIBUTION OF AUTOPSIES BY AGE AND POPULATION GROUP (2014)**

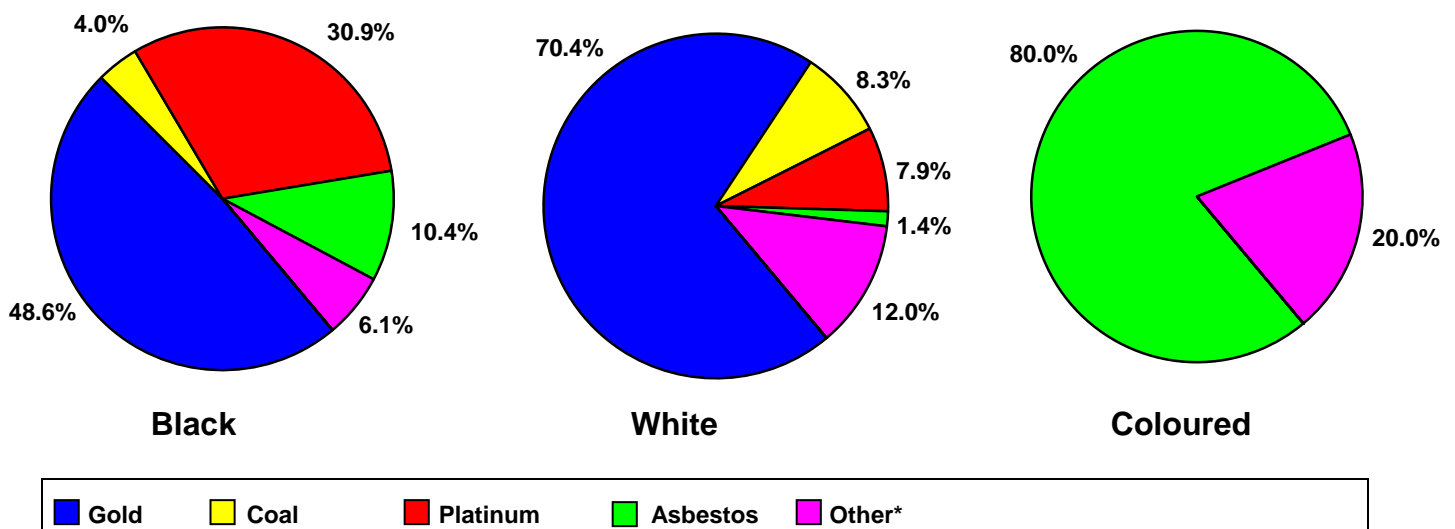
Cases were placed in categories according to the commodity in which they had worked for the longest duration (most exposure). Many men, however, worked in a number of different mining commodities during their lifetimes and had “mixed” exposures. This was not taken into account in the analysis of exposure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

Table 2-4 and Figure 2-2 show the distributions of autopsies by commodity and population group for 2014. Of the cases received, 57.1% were from the gold mining industry; fewer than in 2013 (59.1%). The proportion of autopsies from the platinum mining industry has increased over the years, from 8.3% in 1999 to 21.4% in 2014. Of the coloured cases autopsied, four had been exposed to asbestos in the mining industry.

**TABLE 2-4 NUMBER AND PROPORTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Gold	305	48.6	304	70.4	0	-	0	-	0	-	609	57.1
Platinum	194	30.9	34	7.9	0	-	0	-	0	-	228	21.4
Coal	25	4.0	36	8.3	0	-	1	100.0	0	-	62	5.8
Asbestos	65	10.4	6	1.4	4	80.0	0	-	0	-	75	7.0
Iscor	1	0.2	11	2.5	0	-	0	-	0	-	12	1.1
Copper	3	0.5	9	2.1	0	-	0	-	0	-	12	1.1
Manganese	7	1.1	1	0.2	0	-	0	-	0	-	8	0.8
Industry	2	0.3	5	1.2	0	-	0	-	0	-	7	0.7
Other	23	3.7	17	3.9	1	20.0	0	-	0	-	41	3.8
Unknown	2	0.3	9	2.1	0	-	0	-	1	100.0	12	1.1
<b>Total</b>	<b>627</b>		<b>432</b>		<b>5</b>		<b>1</b>		<b>1</b>		<b>1 066</b>	

Note: this table shows only those commodities where a total of 6 or more cases were received



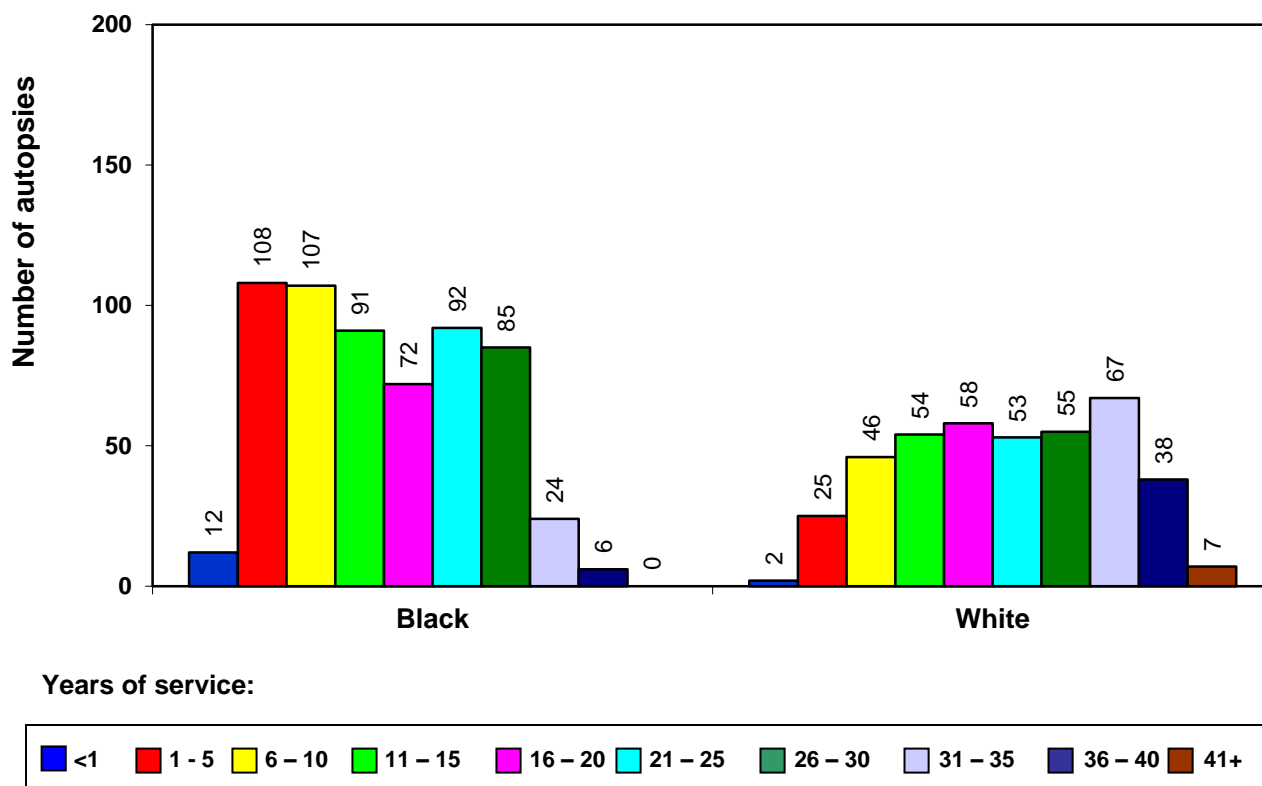
\* Includes chrome, diamond, iron, lead, minerals, non-miner, nickel, phosphate, silica, steel, vanadium, zinc, as well as cases where service histories could not be obtained

**FIG 2-2 DISTRIBUTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (2014)**

Detailed information about the years in mining service, by population group are shown in Table 2-5 and Figure 2-3. In 2014, the duration of service was obtained for all but 5.5% of cases. This figure is lower than that for 2013 (6.9%).

**TABLE 2-5 NUMBER AND PROPORTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (2014)**

Years of service	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
<1	12	1.9	2	0.5	0	-	0	-	0	-	14	1.3
1-5	108	17.2	25	5.8	1	20.0	1	100.0	0	-	135	12.7
6-10	107	17.1	46	10.6	1	20.0	0	-	0	-	154	14.4
11-15	91	14.5	54	12.5	0	-	0	-	0	-	145	13.6
16-20	72	11.5	58	13.4	1	20.0	0	-	0	-	131	12.3
21-25	92	14.7	53	12.3	1	20.0	0	-	0	-	146	13.7
26-30	85	13.6	55	12.7	0	-	0	-	0	-	140	13.1
31-35	24	3.8	67	15.5	0	-	0	-	0	-	91	8.5
36-40	6	1.0	38	8.8	0	-	0	-	0	-	44	4.1
41+	0	-	7	1.6	0	-	0	-	0	-	7	0.7
Unknown	30	4.8	27	6.3	1	20.0	0	-	1	100.0	59	5.5
Total	627		432		5		1		1		1 066	



**FIG 2-3 DISTRIBUTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (2014)**

The mean age and duration of service by commodity 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 (2014)**

Commodity	Black			White		
	N	Mean (Years)	SD*	N	Mean (Years)	SD*
Gold	305	48	10	304	69	11
Platinum	194	46	9	34	57	16
Coal	25	51	9	36	66	11
Asbestos	65	66	10	6	77	4
Iscor	1	52	-	11	69	11
Copper	3	69	8	9	65	12
Manganese	7	58	15	1	83	-
Industry	2	61	16	5	68	12
Other	22	59	9	17	64	14
Unknown	2	56	20	9	62	10
<b>Total</b>	<b>626</b>	<b>50</b>	<b>12</b>	<b>432</b>	<b>67</b>	<b>12</b>

\* Standard deviation

**TABLE 2-7 MEAN DURATION OF SERVICE BY COMMODITY AND POPULATION GROUP (2014)**

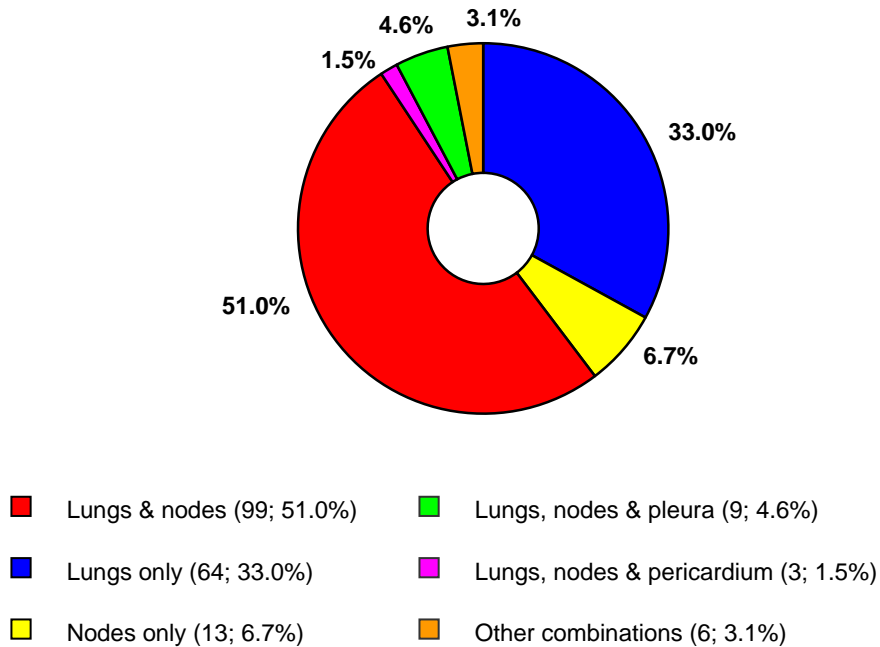
Commodity	Black			White		
	N	Mean (Years)	SD*	N	Mean (Years)	SD*
Gold	303	18	9	296	24	10
Platinum	190	14	9	30	15	10
Coal	23	22	11	34	17	10
Asbestos	61	8	8	5	10	6
Iscor	0	-	-	11	28	14
Copper	3	22	16	8	19	11
Manganese	6	8	9	1	13	-
Industry	2	16	13	5	13	8
Other	9	18	10	15	21	12
<b>Total</b>	<b>597</b>	<b>16</b>	<b>10</b>	<b>405</b>	<b>22</b>	<b>11</b>

\*Standard deviation

## SECTION 3 – ACTIVE TUBERCULOSIS

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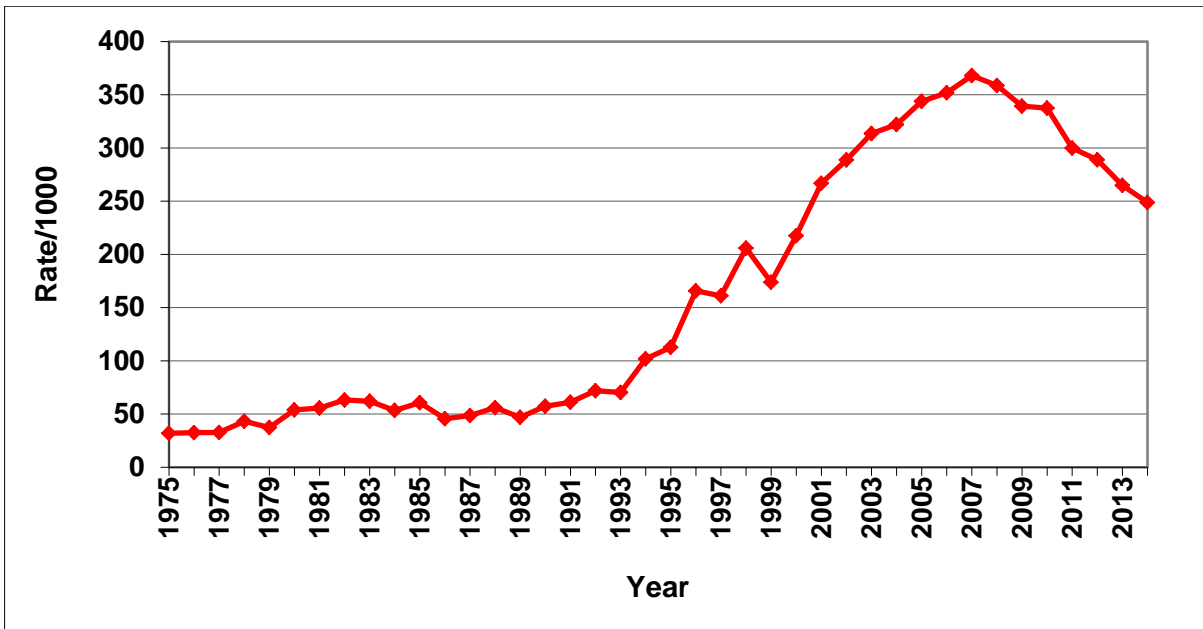
The distribution of active tuberculosis (TB) by anatomical site is presented in Figure 3-1 (n=194). Active pulmonary TB (PTB) was diagnosed in 16.6% (n=177) of all cases autopsied in 2014, compared to 27.4% (n=472) in 2007. Most of the men with PTB were black (n=156; 88.1%) and 21(11.9%) were white.



**FIG 3-1 DISTRIBUTION OF ACTIVE TB BY SITE (2014)**

The rates in subsequent tables and figures are expressed per 1000.

In 2014, the overall PTB rate was 166/1000. In black miners, PTB rates increased from the early 1990s to 2007 (368/1000) and have declined annually to 249/1000 in 2014 (Fig 3-2). The rate in white men remained lower than that in black men, but increased from 43/1000 in 2012 to 62/1000 in 2013 and decreased to 49/1000 in 2014.



**FIG 3-2 ACTIVE PTB RATES IN BLACK MINERS AT AUTOPSY (1975 to 2014)**

The distribution of active PTB cases by commodity is shown in Table 3-1. Most cases of active PTB (63.3%) were from the gold (57.1% of all autopsy cases came from that commodity) and platinum (27.7%) mining industries.

**TABLE 3-1 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY COMMODITY AND POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	93	305	19	63	0	-	0	-	0	-	112	184
Platinum	47	242	2	-	0	-	0	-	0	-	49	215
Coal	3	-	0	-	0	-	0	-	0	-	3	-
Asbestos	7	108	0	-	0	-	0	-	0	-	7	93
Other	6	261	0	-	0	-	0	-	0	-	6	146
<b>Total</b>	156	249	21	49	0		0		0		177	166

Note: rates have not been calculated where there are fewer than 6 cases



The age distribution of cases with active PTB is shown in Table 3-2. Most of the PTB cases (n=69; 39.0%) were in the age group 50-59 years, followed by those in the 40-49 year age group (n=45; 25.4%).

**TABLE 3-2 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY AGE AND POPULATION GROUP (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
20-29	4	-	0	-	0	-	0	-	0	-	4	-
30-39	29	279	0	-	0	-	0	-	0	-	29	269
40-49	44	277	1	-	0	-	0	-	0	-	45	241
50-59	67	279	2	-	0	-	0	-	0	-	69	211
60-69	9	148	9	85	0	-	0	-	0	-	18	107
70-79	2	-	6	43	0	-	0	-	0	-	8	48
80+	0	-	3	-	0	-	0	-	0	-	3	-
Unknown	1	-	0	-	0	-	0	-	0	-	1	-
<b>Total</b>	<b>156</b>	<b>249</b>	<b>21</b>	<b>49</b>	<b>0</b>		<b>0</b>		<b>0</b>		<b>177</b>	<b>166</b>

Note: rates have not been calculated where there are fewer than 6 cases

## SECTION 4 – SILICOSIS

Silicotic nodules were found in the lungs of 206 cases (19.3% of all autopsies), 87.9% of which came from the gold mining industry. Of all cases of silicosis, occasional silicotic nodules were found in 69 (33.5%) of cases, a few in 62 (30.1%), a moderate number in 62 (30.1%) and a large number in 13 (6.3%) cases.

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

**TABLE 4-1 NUMBER OF CASES AND PREVALENCE OF SILICOSIS BY COMMODITY AND POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	114	374	67	220	0	-	0	-	0	-	181	297
Platinum	11	57	4	-	0	-	0	-	0	-	15	66
Coal	1	-	3	-	0	-	0	-	0	-	4	-
Asbestos	2	-	0	-	0	-	0	-	0	-	2	-
Manganese	0	-	1	-	0	-	0	-	0	-	1	-
Other	2	-	1	-	0	-	0	-	0	-	3	-
<b>Total</b>	130	207	76	176	0		0		0		206	193

Note: rates have not been calculated where there are fewer than 6 cases

Silicosis in gold miners is shown in the following tables. The rate of silicosis in gold miners has decreased from 333/1000 in 2013 to 297/1000 in 2014. The age distribution of silicosis differed between the black and white men (Table 4-2). In black men, silicosis was also diagnosed in one young man aged below 40 years (Table 4-2).

**TABLE 4-2 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLDMINING INDUSTRY, BY AGE AND POPULATION GROUP (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	Rate	N	Rate	N	Rate	N	N	Rate	N	Rate	N	Rate
20-29	1	-	0	-	0	-	0	-	0	-	1	-
30-39	0	-	0	-	0	-	0	-	0	-	0	-
40-49	26	299	2	-	0	-	0	-	0	-	28	277
50-59	75	586	3	-	0	-	0	-	0	-	78	431
60-69	9	500	21	266	0	-	0	-	0	-	30	309
70-79	1	-	29	276	0	-	0	-	0	-	30	275
80+	2	-	12	235	0	-	0	-	0	-	14	255
<b>Total</b>	<b>114</b>	<b>374</b>	<b>67</b>	<b>220</b>	<b>0</b>		<b>0</b>		<b>0</b>		<b>181</b>	<b>297</b>

Note: rates have not been calculated where there are fewer than 6 cases

**TABLE 4-3 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLD MINING INDUSTRY, BY YEARS OF SERVICE AND POPULATION GROUP (2014)**

Years of service	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
1-5	1	-	1	-	0	-	0	-	0	-	2	-
6-10	4	-	1	-	0	-	0	-	0	-	5	-
11-15	12	273	8	229	0	-	0	-	0	-	20	253
16-20	18	439	10	233	0	-	0	-	0	-	28	333
21-25	27	587	8	178	0	-	0	-	0	-	35	385
26-30	38	623	16	340	0	-	0	-	0	-	54	500
31-35	13	765	14	255	0	-	0	-	0	-	27	375
36-40	1	-	6	188	0	-	0	-	0	-	7	200
41+	0	-	3	-	0	-	0	-	0	-	3	-
<b>Total</b>	<b>114</b>	<b>374</b>	<b>67</b>	<b>220</b>	<b>0</b>		<b>0</b>		<b>0</b>		<b>181</b>	<b>297</b>

Note: rates have not been calculated where there are fewer than 6 cases

## SECTION 5 – OTHER PNEUMOCONIOSES

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### MASSIVE FIBROSIS

There were 14 (1.3%) cases of massive fibrosis (10 black, 4 white). Ten were from the gold, one each from the platinum, coal and asbestos industries, and in one case the commodity was not known.

### COAL WORKERS' PNEUMOCONIOSIS

There were 3 (0.3%) cases of coal workers' pneumoconiosis. All were from the coal mining industry.

### MIXED DUST PNEUMOCONIOSIS

There were 5(0.5%) cases of mixed dust pneumoconiosis. Three were from the gold, one was from the coal and one was from the copper mining industry.

### ASBESTOSIS AND PLEURAL PLAQUES

There were 53 cases of asbestosis. Of these, 43.4% (n=23) had slight, 30.2% (n=16) had moderate and 26.4% (n=14) had marked fibrosis. Forty two (79.2%) of these cases had worked in the asbestos mining industry at some time in their lives and one had been exposed to asbestos in the environment.

There were 33 cases with asbestos plaques and of these 22 had asbestosis. 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.

**TABLE 5-1 NUMBER OF CASES AND PREVALENCE OF ASBESTOSIS BY AGE AND POPULATION GROUP (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
50-59	4	-	1	-	1	-	0	-	0	-	6	18
60-69	15	246	2	-	1	-	0	-	0	-	18	107
70-79	12	414	5	-	0	-	0	-	0	-	17	102
80+	7	583	3	-	2	-	0	-	0	-	12	143
<b>Total</b>	<b>38</b>	<b>61</b>	<b>11</b>	<b>25</b>	<b>4</b>	<b>-</b>	<b>0</b>		<b>0</b>		<b>53</b>	<b>50</b>

Note: rates have not been calculated where there are fewer than 6 cases

## SECTION 6 – EMPHYSEMA

There were 336 cases of emphysema, the extent of which was mild in 68.5% (n=230), moderate in 20.8% (n=70) and marked in 10.7% (n=36). The overall rate of emphysema increased from 250/1000 in 2010 to 355/1000 in 2013, and decreased to 315/1000 in 2014. 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 (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
30-39	3	-	-	-	0	-	0	-	0	-	3	-
40-49	23	145	4	-	0	-	0	-	0	-	27	144
50-59	54	225	30	353	0	-	0	-	0	-	84	257
60-69	28	459	57	538	0	-	0	-	0	-	85	506
70-79	11	379	85	616	0	-	0	-	0	-	96	575
80+	3	-	38	551	0	-	0	-	0	-	41	488
<b>Total</b>	<b>122</b>	<b>195</b>	<b>214</b>	<b>495</b>	<b>0</b>		<b>0</b>		<b>0</b>		<b>336</b>	<b>315</b>

Note: rates have not been calculated where there are fewer than 6 cases

Most of the men with emphysema were from the gold mining industry (n=206, 61.%) (Table 6-2).

**TABLE 6-2 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY COMMODITY AND POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	54	177	152	500	0	-	0	-	0	-	206	338
Platinum	26	134	10	294	0	-	0	-	0	-	36	158
Coal	9	360	21	583	0	-	0	-	0	-	30	484
Asbestos	23	354	5	-	0	-	0	-	0	-	28	373
Iscor	0	-	3	-	0	-	0	-	0	-	3	-
Copper	3	-	6	667	0	-	0	-	0	-	9	750
Manganese	2	-	1	-	0	-	0	-	0	-	3	-
Industry	0	-	3	-	0	-	0	-	0	-	3	-
Other	5	-	9	529	0	-	0	-	0	-	14	341
Unknown	0	-	4	-	0	-	0	-	0	-	4	-
<b>Total</b>	<b>122</b>	<b>195</b>	<b>214</b>	<b>495</b>	<b>0</b>		<b>0</b>		<b>0</b>		<b>336</b>	<b>315</b>

Note: rates have not been calculated where there are fewer than 6 cases

**TABLE 6-3 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY YEARS OF SERVICE AND POPULATION GROUP (2014)**

Years of service	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
<1	6	500	0	-	0	-	0	-	0	-	6	429
1-5	12	111	13	520	0	-	0	-	0	-	25	185
6-10	12	112	24	522	0	-	0	-	0	-	36	234
11-15	21	231	30	556	0	-	0	-	0	-	51	352
16-20	21	292	23	397	0	-	0	-	0	-	44	336
21-25	21	228	28	528	0	-	0	-	0	-	49	336
26-30	17	200	29	527	0	-	0	-	0	-	46	329
31-35	5	-	31	463	0	-	0	-	0	-	36	396
36-40	3	-	20	526	0	-	0	-	0	-	23	523
41+	0	-	3	-	0	-	0	-	0	-	3	-
Unknown	4	-	13	481	0	-	0	-	0	-	17	288
Total	122	195	214	495	0		0		0		336	315

Note: rates have not been calculated where there are fewer than 6 cases

## SECTION 7 – MESOTHELIOMA

There were 36 of cases of mesothelioma in 2014.

**TABLE 7-1 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY AGE AND POPULATION GROUP (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
40-49	1	3.4	0	-	0	-	0	-	0	-	1	2.8
50-59	14	48.3	5	36	0	-	0	-	0	-	19	52.8
60-69	6	20.7	0	-	0	-	0	-	0	-	6	16.7
70-79	6	20.7	0	-	0	-	0	-	0	-	6	16.7
80+	2	6.9	2	14	0	-	0	-	0	-	4	11.1
<b>Total</b>	<b>29</b>		<b>7</b>		<b>0</b>		<b>0</b>		<b>0</b>		<b>36</b>	

The distribution of mesothelioma by commodity and population group is presented in Table 7.2.

Twenty three (63.9%) of the cases had worked in asbestos mines at some stage in their careers and five (13.9%) had been exposed to asbestos in the environment.

**TABLE 7-2 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY COMMODITY AND POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Asbestos	15	51.7	0	-	0	-	0	-	0	-	15	41.7
Gold	3	10.3	3	42.9	0	-	0	-	0	-	6	16.7
Coal	0	-	1	14.3	0	-	0	-	0	-	1	2.8
Platinum	4	13.8	1	14.3	0	-	0	-	0	-	5	13.9
Manganese	2	6.9	0	-	0	-	0	-	0	-	2	5.6
Other	5	17.2	2	28.6	0	-	0	-	0	-	7	19.4
<b>Total</b>	<b>29</b>		<b>7</b>		<b>0</b>		<b>0</b>		<b>0</b>		<b>36</b>	

## SECTION 8 – PRIMARY LUNG CANCER

Forty one cases of primary lung cancer were found at autopsy, 34.2% (n=14) of which were in black, 63.4%(n=26) in white and 2.4% (n=1) in coloured miners. Most of the cases had small cell lung carcinoma (n=13, 31.7%) followed by those with squamous cell lung carcinoma (n=12; 29.3%), adenocarcinoma (n=11; 26.8%) and large cell lung carcinoma (n=5; 12.2%).

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

**TABLE 8-1 NUMBER AND PROPORTION OF PRIMARY LUNG CANCER CASES BY AGE AND POPULATION GROUP (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
40-49	3	-	0	-	0	-	0	-	0	-	3	-
50-59	7	29	5	-	0	-	0	-	0	-	12	37
60-69	1	-	5	-	0	-	0	-	0	-	6	36
70-79	2	-	13	94	0	-	0	-	0	-	15	90
80+	1	-	3	-	1	-	0	-	0	-	5	-
<b>Total</b>	<b>14</b>	<b>22</b>	<b>26</b>	<b>60</b>	<b>1</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>41</b>	<b>38</b>

Note: rates have not been calculated where there are fewer than 6 cases

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 AND PROPORTION OF PRIMARY LUNG CANCER CASES BY COMMODITY AND POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Gold	6	20	20	66	0	-	0	-	0	-	26	85
Platinum	3	-	1	-	0	-	0	-	0	-	4	-
Coal	2	-	1	-	0	-	0	-	0	-	3	-
Asbestos	1	-	0	-	1	-	0	-	0	-	2	-
Iscor	0	-	3	-	0	-	0	-	0	-	3	-
Manganese	1	-	0	-	0	-	0	-	0	-	1	-
Industry	0	-	1	-	0	-	0	-	0	-	1	-
Other	1	-	0	-	0	-	0	-	0	-	1	-
<b>Total</b>	<b>14</b>	<b>22</b>	<b>26</b>	<b>60</b>	<b>1</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>41</b>	<b>38</b>

Note: rates have not been calculated where there are fewer than 6 cases

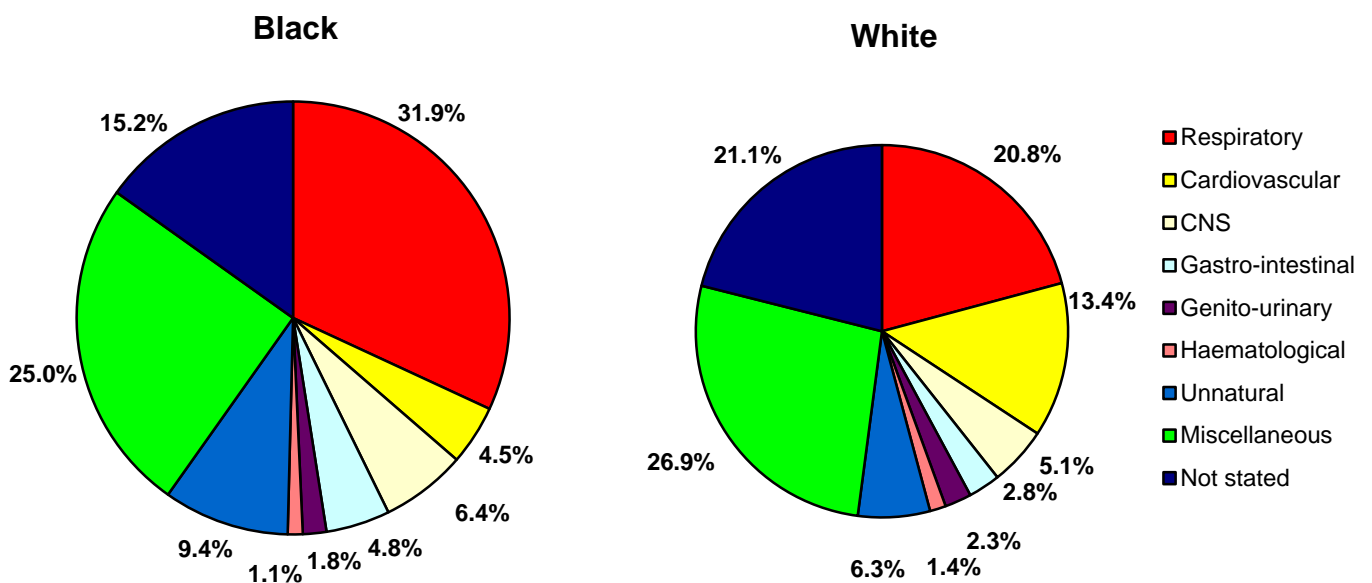


## SECTION 9 – CLINICAL CAUSE OF DEATH

Table 9-1 and Figure 9-1 show the clinical cause of death as stated in the accompanying documents submitted with the cardio-respiratory organs, by population group. Diseases of the respiratory system were the most frequent (27.6%). The proportion of unnatural deaths (8.1%) was similar to that in 2013 (7.8%). The clinical cause of death was not stated for 17.6% of the cases.

**TABLE 9-1 CLINICAL CAUSE OF DEATH BY POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Respiratory	200	31.9	90	20.8	3	60.0	1	100.0	0	-	294	27.6
Cardio-vascular	28	4.5	58	13.4	0	-	0	-	0	-	86	8.1
Central Nervous System	40	6.4	22	5.1	0	-	0	-	0	-	62	5.8
Gastro-intestinal	30	4.8	12	2.8	0	-	0	-	0	-	42	3.9
Genito-urinary	11	1.8	10	2.3	0	-	0	-	0	-	21	2.0
Haematological	7	1.1	6	1.4	0	-	0	-	0	-	13	1.2
Unnatural	59	9.4	27	6.3	0	-	0	-	0	-	86	8.1
Miscellaneous	157	25.0	116	26.9	1	20.0	0	-	0	-	274	25.7
Not stated	95	15.2	91	21.1	1	20.0	0	0.0	1	100.0	188	17.6
<b>Total</b>	<b>627</b>		<b>432</b>		<b>5</b>		<b>1</b>		<b>1</b>		<b>1 066</b>	



**FIGURE 9-1 CLINICAL CAUSES OF DEATH (2014)**

## SECTION 10 – AUTOPSY FINDINGS IN WOMEN

Of the 1 066 cases examined in 2014, 49 (4.6%) were women, compared to 32 (2.7%) in 2013 and 58 (5.0%) in 2012. Of these, 44 (89.8%) were black, 2 (4.1%) were white and 3 (6.1%) were coloured. The mean ages of the women and men were similar (55.8 years and 57.2 years, respectively).

**TABLE 10-1 NUMBER AND PROPORTION OF AUTOPSIES IN WOMEN BY AGE AND POPULATION GROUP (2014)**

Age group (years)	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
20-29	1	2.3	0	-	0	-	0	-	0	-	1	2.0
30-39	6	13.6	0	-	0	-	0	-	0	-	6	12.2
40-49	12	27.3	0	-	0	-	0	-	0	-	12	24.5
50-59	7	15.9	2	100.0	1	33.3	0	-	0	-	10	20.4
60-69	8	18.2	0	-	0	-	0	-	0	-	8	16.3
70-79	8	18.2	0	-	0	-	0	-	0	-	8	16.3
80+	2	4.5	0	-	2	66.7	0	-	0	-	4	8.2
<b>Total</b>	<b>44</b>		<b>2</b>		<b>3</b>		<b>0</b>		<b>0</b>		<b>49</b>	

Table 10.2 summarises the distribution of autopsies in women by commodity and population group. Most of the women (n=24, 49.0%) had been exposed to asbestos, with 15 (30.6%) of these exposed on the mines and 9 (18.4%) having had environmental exposure.

**TABLE 10-2 NUMBER AND PROPORTION OF AUTOPSIES IN WOMEN BY COMMODITY AND POPULATION GROUP (2014)**

Commodity	Black		White		Coloured		Indian		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Gold	18	40.9	0	-	0	-	0	-	0	-	18	36.7
Platinum	5	11.4	0	-	0	-	0	-	0	-	5	10.2
Asbestos	13	29.5	0	-	2	66.7	0	-	0	-	15	30.6
Other	7	15.9	1	50.0	1	33.3	0	-	0	-	9	18.4
Unknown	1	2.3	1	50.0	0	-	0	-	0	-	2	4.1
<b>Total</b>	<b>44</b>		<b>2</b>		<b>3</b>		<b>0</b>		<b>0</b>		<b>49</b>	

There were 15 cases of asbestos-related disease: 7 had asbestosis and 8 had mesothelioma (Table 10.3).

**TABLE 10-3 NUMBER AND PROPORTION OF DISEASES IN WOMEN (2014)**

<b>Disease</b>	<b>N</b>	<b>%</b>
PTB	12	24.5
Silicosis	1	2.0
Emphysema	4	8.2
Asbestosis	7	14.3
Mesothelioma	8	16.3
Lung cancer	0	-
No lung disease	17	34.7
Total	49	

**APPENDIX 1: DISTRIBUTION OF AUTOPSIES ACCORDING TO THE LAST MINE WHERE THE DECEASED WORKED (2014)**

<b>Commodity</b>	<b>Last mine worked</b>	<b>Black</b>	<b>White</b>	<b>Coloured</b>	<b>Indian</b>	<b>Unknown</b>	<b>Total</b>
<b>Asbestos</b>	African Chrysotile Asbestos		1				1
	Asbestos Mine	3	1				4
	Black Rock Asbestos Mine	2					2
	Cape Blue	4		1			5
	Gefco	44	4	1			49
	Groenwater Asbestos Mine	1					1
	King Matshaba Mine Zimbabwe		1				1
	Koegas			2			2
	Penge Asbestos		2				2
	Pomfret Asbestos Mine	4					4
<b>Total from asbestos</b>		<b>58</b>	<b>9</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>71</b>
<b>Cementation</b>	Cementation		2				2
<b>Chrome</b>	Chrome Mine		1				1
<b>Coal</b>	Arnot Colliery	4	1				5
	Bank Colliery		3				3
	Brandspruit Colliery		1				1
	Coal Mine	1	4				5
	Coalbrook Colliery		1				1
	Delmas Colliery		1				1
	Douglas Colliery		2				2
	Duiker Colliery		1				1
	Durban Navigation Colliery		1				1
	EikeboomColl		1				1
	Goedehoop Colliery	2	1				3
	Greenside Colliery		2				2
	Khutala Colliery		2				2
	Kleinkopje Colliery	1					1
	Koornfontein Coal		1				1
	Kriel Colliery		1				1
	Leeufontein Colliery		1				1
	Matla Coal	14	2				16
	New Denmark	1					1
	New Vaal Colliery		2				2
	Optimum Colliery				1		1

<b>Commodity</b>	<b>Last mine worked</b>	<b>Black</b>	<b>White</b>	<b>Coloured</b>	<b>Indian</b>	<b>Unknown</b>	<b>Total</b>
Coal (continued)	Phoenix Colliery		1				1
	Sasol Coal Mine	1	2				3
	Secunda Colliery	1	2				3
	Sigma Colliery	1					1
	Springfield Colliery		1				1
	Springbok Colliery		1				1
	Strathrae Collieries		1				1
	Tavistok Colliery		1				1
	Tweefontein		1				1
	Union Coal Mine		1				1
	Vierfontein Colliery		1				1
	Vryheid Coronation		2				2
	Witbank Collieries	1	2				3
<b>Total from coal</b>		<b>27</b>	<b>44</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>72</b>
<b>Copper</b>	Copper Mine		2				2
	O`Kiep Copper	2	6				8
	Prieska	1					1
<b>Total from copper</b>		<b>3</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>11</b>
<b>Diamond</b>	De Beers Consolidated	1	3				4
	Diamond Mine	1					1
	Messina Diamond Mine	1					1
<b>Total from diamond mines</b>		<b>3</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>
<b>Gold</b>	Anglogold Ashanti GM	18	8				26
	Anglogold Great Noligwa	4					4
	Bambanani GM		2				2
	Barberton GM		2				2
	Beatrix Gold	28	3				31
	Blyvoorquizicht		13				13
	Bracken Mines		1				1
	Buffelsfontein Gold	3	9				12
	Consolidated Modderfontein		1				1
	Consolidated Murchison		1				1
	Deelkraal		1				1
	Doornfontein		4				4
	Driefontein Cons GM	4	5				9

Commodity	Last mine worked	Black	White	Coloured	Indian	Unknown	Total
Gold (contd)	Durban Roodepoort Deep		4				4
	East Driefontein	1	9				10
	East Rand Prop	1	8				9
	Elandsrand		5				5
	Evander GM	2					2
	Ezulwini Gold Mine	2					2
	Freddies Gold	1	1				2
	Free State Geduld		13				13
	Free State Saaiplaas		2				2
	Gencor	9					9
	Gold mine	1	3				4
	Grinaker GM		1				1
	Grootvlei Prop		1				1
	Harmony	151	26				177
	Hartebeesfontein		13				13
	Kinross		4				4
	Kloof	10	12				22
	Leeudoorn		2				2
	Libanon		3				3
	Lorraine		3				3
	Moab Khotsong GM		2				2
	Modderfontein		1				1
	Nigel GM		1				1
	Oryx	2	2				4
	President Brand	1	5				6
	President Steyn		4				4
	Rand Uranium Gold Mine		1				1
	Randfontein	5	12				17
	Simmer & Jack GM	1					1
	South Deep GM		6				6
	St Helena	2	3				5
	Stilfontein		5				5
	Tautona GM		1				1
	Transvaal GM		1				1
	Tshepone GM		1				1
	Unisel GM		1				1
	Vaal Reefs	31	23				54

<b>Commodity</b>	<b>Last mine worked</b>	<b>Black</b>	<b>White</b>	<b>Coloured</b>	<b>Indian</b>	<b>Unknown</b>	<b>Total</b>
Gold (contd)	Ventersport		1				1
	West Driefontein		14				14
	West Rand Consolidation		2				2
	West Witwatersrand	2	1				3
	Western Areas		3				3
	Western Deep Levels	4	15				19
	Western Holdings		5				5
	Winkelhaak		4				4
	Wit Nigel GM		1				1
<b>Total from gold</b>		<b>283</b>	<b>275</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>558</b>
<b>Iron</b>	Iron Ore Mine	1	3				4
<b>Lead &amp; Minerals</b>	Blackmountain		3				3
<b>Manganese</b>	Associated Manganese	2					2
	Hotazel Manganese Mine	1	1				2
	National Manganese	1					1
	S A Manganese	2	1				3
<b>Total from manganese</b>		<b>6</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>
<b>Platinum</b>	Amadelbult Platinum (Rustenburg)	2	2				4
	Bafokeng		1				1
	Eastern Platinum Mine	28					28
	Impala Platinum	102	16				118
	Karee Platinum	34					34
	Lebowa Platinum Mine		1				1
	Lonmin Platinum	2	3				5
	Modikwa Plat Mine		1				1
	Northam Platinum	3	4				7
	Rustenburg Platinum	6	7				13
	San Labour Hire (Contract)		1				1
	Unknown Plantinum	2	11				13
	Western Platinum	40	1				41
	Wildebeestfontein		1				1
<b>Total from platinum</b>		<b>219</b>	<b>49</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>268</b>

<b>Commodity</b>	<b>Last mine worked</b>	<b>Black</b>	<b>White</b>	<b>Coloured</b>	<b>Indian</b>	<b>Unknown</b>	<b>Total</b>
<b>Silicon</b>	Delmas Silica	1					1
	Silicon Smelters	2	1				3
<b>Total from silicon</b>		<b>3</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Shaft sinkers</b>	Shaft sinkers		2				2
<b>Steel &amp; Iron</b>	Iskor	2	10				12
<b>Steel &amp; Vanadium</b>	Highveld Steel and Vanadium		2				2
<b>Vanadium</b>	Steelpoort		1				1
	Rhovani Vanadium Mine		1				1
<b>Total from vanadium</b>			<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>Non-miner</b>	Chamber of Mines		1				1
	Environmental	16	1	1			18
	ESKOM		2				2
	Industry	2	2				4
<b>Total for non-miners</b>		<b>18</b>	<b>6</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>25</b>
<b>Unknown</b>	Unknown	2	9			1	12
<b>TOTAL</b>		<b>627</b>	<b>432</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>1066</b>



## APPENDIX 2: PUBLICATIONS AND ACTIVITIES EMANATING FROM PATHAUT DATA OR AUTOPSY SERVICE (2014)

### Journal articles

Gonzalez-Cuyar LF, Nelson G, Criswell SR, Ho P, Lonzanida JA, Checkoway H, Seixas N, Gelman BB, Evanoff BA, Murray J, Zhang J, Racette BA. 2014. Quantitative neuropathology associated with chronic manganese exposure in South African mine workers. *Neurotoxicology* 45: 260-266

Phillips JI, Nelson G, Vorajee N, Murray J, Ndlovu N, Davies JCA. 2014. Marikana autopsies highlight occupational diseases and social issues amongst platinum mine workers. *Occup Health Southern Afr*: 20: 6-12.

Field N, Lim MSC, Murray J, Dowdeswell RJ, Glynn JR, Sonnenberg P. 2014. Timing, rates, and causes of death in a large South African tuberculosis programme. *BMC Infect Dis* 14 (3858):1-12. DOI 10.1186/s12879-014-0679-9

### Reports

Ndlovu N, Boshomane J, Davies JA, Murray J, Vorajee N. Pathology Division Report: Demographic data and disease rates for January to December 2013. NIOH Report 1/2014, ISSN 1812-7681. National Institute for Occupational Health, National Health Laboratory Services, South Africa. [http://www.nioh.ac.za/?page=pathology\\_disease\\_surveillance\\_reports&id=162](http://www.nioh.ac.za/?page=pathology_disease_surveillance_reports&id=162)

### Congresses

Vorajee N. Screening for occupational lung cancer. Training seminar on Occupational Cancers, 12 February 2014, Sunnyside Johannesburg, South Africa (Oral presentation)

Nelson G, Racette BA. Workshop Session: Is Manganese-Induced Parkinsonism Mediated via Dopamine Neuron Degeneration or Dysfunction? Presentation title: Pre- and post-synaptic dopaminergic dysfunction in Mn-exposed workers. Society of Toxicology (53rd Annual Meeting and ToxExpo), 23-27 March 2014, Phoenix, Arizona, USA (Shared oral presentation)

Criswell SR, Nelson G, Gonzalez-Cuyar LF, Huang J, Shimony JS, Checkoway H, Simpson CD, Racette BA. *Ex-vivo* MRI in manganese exposed South African miners. 18th International Congress of Parkinson's Disease and Movement Disorders, 12 June 2014, Stockholm, Sweden

Vorajee N. Occupational Interstitial lung disease. South African Thoracic Society Airwaves Congress, 21-23 June 2014, University of KwaZulu Natal, Umhlanga, South Africa (Oral presentation)

Murray J, Ndlovu N, Silicosis and pulmonary tuberculosis in South African miners: 1975 – 2012. European Respiratory Society International Congress, 6-10 September 2014, Munich, Germany (Poster presentation)

Ndlovu N, Murray J. Asbestos-related disease trends in South African miners: 1975-2012. Faculty of Health Sciences Research Day and Postgraduate Expo, 17 September 2014, Johannesburg, South Africa (Poster presentation)

Murray J, Ndlovu N, teWaterNaude J. Clinico-pathological correlation of asbestos-related diseases in former miners. 12th International Mesothelioma Interest Group Conference, 22-24 October 2014, Cape Town, South Africa (Oral presentation)

Ndlovu N, Murray J. Asbestos-related disease trends in the South African miners, 1975-2012. 12th International Mesothelioma Interest Group Conference, 22-24 October 2014, Cape Town, South Africa (Poster presentation)

Vorajee N. Pathological challenges in the diagnosis of malignant mesothelioma of the pleura. 12th International Mesothelioma Interest Group Conference, 22-24 October 2014, Cape Town, South Africa (Oral presentation)

Murray J. Autopsy compensation in the SA mining industry: the PATHAUT database. International Workshop: The role of inorganic particles in pulmonary, systemic and autoimmune diseases. 14-15 November 2015, Sciences Po, Paris, France (Oral presentation)

Nelson G. Silicosis trends in South African miners: 1975-2007. International Workshop: The role of inorganic particles in pulmonary, systemic and autoimmune diseases. 14-15 November 2015, Sciences Po, Paris, France (Oral presentation)

Vorajee N. Silica-related pathology in deceased mine workers over four decades. International Workshop: The role of inorganic particles in pulmonary, systemic and autoimmune diseases. 14-15 November 2015, Sciences Po, Paris, France (Oral presentation)

## Degrees

Milne Simon, PhD (registered in September 2011), School of Public Health, University of the Witwatersrand. The relation between silicosis and silica dust in the lung.

Ndlovu Ntombizodwa, PhD (registered in September 2011), School of Public Health, University of the Witwatersrand. Evaluation of autopsy data for occupational lung disease surveillance.

## Outreach Programme Activities

ACTIVITY	DATE	VENUE	PERSON
NUM congress outreach programme	4 <sup>th</sup> July 2014	Birchwood Hotel	Daniel Afrika
Lung removal	18 <sup>th</sup> July 2014	Martins funerals Brits	Daniel Afrika