



**NATIONAL HEALTH  
LABORATORY SERVICE**

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

---

## **Pathology Division Surveillance Report**

### **Demographic Data and Disease Rates for January to December 2011**

**Ntombizodwa Ndlovu**

**Simon Milne**

**Tony Davies**

**Gill Nelson**

**Jill Murray**

PO Box 4788  
Johannesburg  
2000

e-mail: [jill.murray@nioh.nhls.ac.za](mailto:jill.murray@nioh.nhls.ac.za)

**NIOH Report 1/2012**

[http://www.nioh.ac.za/publications/publications\\_pathaut\\_reports.htm](http://www.nioh.ac.za/publications/publications_pathaut_reports.htm)

## **ACKNOWLEDGEMENTS**

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

Anna Khumalo  
Dan Afrika  
Duduzile Mditshwa  
Estelle Garton  
Goodman Rani  
Jim Phillips  
Joseph Mukhovi  
Julienne Mthombeni  
Juliet Buthelezi  
Morwesi Ntlane  
Naseema Vorajee  
Nokwanda Ngcakaza  
Patrick Mbhontsi  
Palesa Mothei  
Peter Masilo  
Rosinah Soko  
Wilson Mashele

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

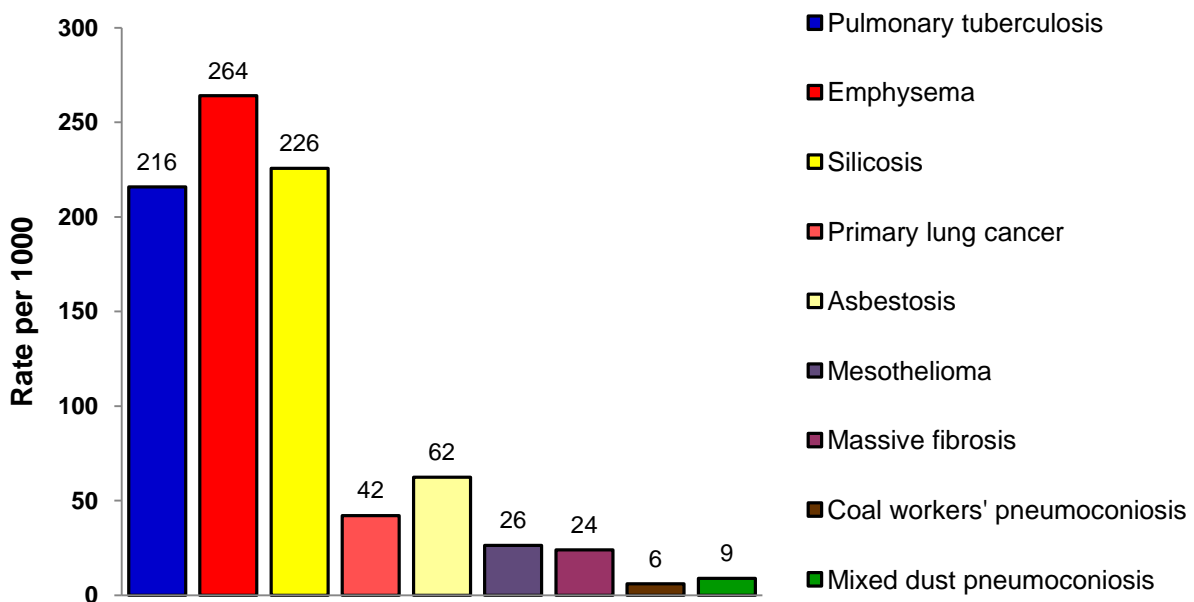
ISSN 1812-7681

## EXECUTIVE SUMMARY

---

During 2011, 1 329 deceased cases were examined at the NIOH. Of these, 63.7% were black, 34.1% were white, 0.8% were coloured and 1.4% were submitted without information on population group. Of the cases submitted, 45.8% (n=609) cases were ex-miners, 50.9% (n=676) current miners and 3.3% (n=44) cases could not be classified.

The overall disease rates (per 1000 autopsies) for 2011 are shown in Figure 1.



**FIG.1 OVERALL DISEASE RATES FOR 2011**

The overall rate of pulmonary tuberculosis (PTB) in 2011 (216/1000) was lower than that in 2010 (231/1000). The rate in black gold miners remains high (346/1000 in 2011). In black platinum miners, a further decrease from 289/1000 in 2010 to 262/1000 in 2011 was observed.

The overall silicosis rate in 2011 (226/1000) was similar to that in 2010 (233/1000). The rate in black gold miners decreased from 378/1000 in 2010 to 362/1000 in 2011.

Forty five women came to autopsy in 2011, 28.9% (n=13) of whom had diseases related to asbestos exposure in mining or in the environment.

Some cases were received with incomplete exposure information. The type (commodity), duration of service and last mine worked were not provided for 28 (1.9%), 45 (3.4%) and 30 (2.3%) of the cases respectively.

In 2010, a new field naming the province or foreign country from which the organs were sent was added to the PATHAUT database. Table 1 shows the distribution of cases by province or country and population group.

**TABLE 1 DISTRIBUTION OF AUTOPSY CASES BY PROVINCE AND POPULATION GROUP (2011)**

| Province or country | Black      |      | White      |      | Coloured  |      | Unknown   |      | Total        |      |
|---------------------|------------|------|------------|------|-----------|------|-----------|------|--------------|------|
|                     | N          | %    | N          | %    | N         | %    | N         | %    | N            | %    |
| Eastern Cape        | 4          | 0.5  | 5          | 1.1  | 0         | -    | 0         | -    | 9            | 0.7  |
| Free State          | 233        | 27.5 | 54         | 11.9 | 0         | -    | 1         | 5.6  | 288          | 21.7 |
| Gauteng             | 102        | 12.0 | 207        | 45.7 | 1         | 9.1  | 0         | -    | 310          | 23.3 |
| Kwazulu-Natal       | 1          | 0.1  | 7          | 1.5  | 0         | -    | 0         | -    | 8            | 0.6  |
| Limpopo             | 15         | 1.8  | 4          | 0.9  | 0         | -    | 0         | -    | 19           | 1.4  |
| Mpumalanga          | 36         | 4.3  | 42         | 9.3  | 0         | -    | 1         | 5.6  | 79           | 5.9  |
| Northern Cape       | 101        | 11.9 | 15         | 3.3  | 9         | 81.8 | 4         | 22.2 | 129          | 9.7  |
| North West          | 325        | 38.4 | 109        | 24.1 | 1         | 9.1  | 11        | 61.1 | 446          | 33.6 |
| Western Cape        | 3          | 0.4  | 10         | 2.2  | 0         | -    | 0         | -    | 13           | 1.0  |
| Lesotho             | 27         | 3.2  | 0          | -    | 0         | -    | 1         | 5.6  | 28           | 2.1  |
| <b>Total</b>        | <b>847</b> |      | <b>453</b> |      | <b>11</b> |      | <b>18</b> |      | <b>1 329</b> |      |

In recognition of the annual decreases in the numbers of cardio-respiratory organs submitted for autopsy (Table 2-1), the Pathology Division launched a programme in 2006 to inform miners and ex-miners of their rights to autopsy examination. The Division has continued to engage occupational health units on the mines, union representatives, undertakers, state hospitals and forensic laboratories (Appendix 2).

During 2011, 5 journal articles utilising PATHAUT data were published (Appendix 2). Research findings were presented at a number of fora and the PATHAUT data were also used for one ongoing and two new PhD studies (University of the Witwatersrand).

# TABLE OF CONTENTS

|  |  |    |
|--|--|----|
| <b>EXECUTIVE SUMMARY</b>                     |  | i  |
| <b>GLOSSARY</b>                              |  | v  |
| <b>SECTION 1: BACKGROUND</b>                 |  | 1  |
| <b>SECTION 2: DEMOGRAPHIC DATA</b>           |  | 2  |
| <b>SECTION 3: ACTIVE TUBERCULOSIS</b>        |  | 8  |
| <b>SECTION 4: SILICOSIS</b>                  |  | 11 |
| <b>SECTION 5: OTHER PNEUMOCONIOSES</b>       |  |    |
| Massive Fibrosis                             |  | 13 |
| Coal Workers' Pneumoconiosis                 |  | 13 |
| Mixed Dust Pneumoconiosis                    |  | 13 |
| Asbestosis and pleural plaques               |  | 13 |
| <b>SECTION 6: EMPHYSEMA</b>                  |  | 14 |
| <b>SECTION 7: MESOTHELIOMA</b>               |  | 16 |
| <b>SECTION 8: PRIMARY LUNG CANCER</b>        |  | 17 |
| <b>SECTION 9: CLINICAL CAUSES OF DEATH</b>   |  | 18 |
| <b>SECTION 10: AUTOPSY FINDINGS IN WOMEN</b> |  | 19 |
| <br><b>LIST OF TABLES</b>                    |  |    |
| <b>Table 1</b>                               | Distribution of autopsy cases by province and population group (2011)  | ii |
| <b>Table 2.1</b>                             | Distribution of autopsies by year and population group (1975-2011)   | 2  |
| <b>Table 2.2</b>                             | Number and proportion of autopsies by type and population group (2011)   | 3  |
| <b>Table 2.3</b>                             | Number and proportion of autopsies by age and population group (2011)  | 3  |
| <b>Table 2.4</b>                             | Number and proportion of autopsies by commodity and population group (2011)  | 5  |
| <b>Table 2.5</b>                             | Number and proportion of autopsies by years of service and population group (2011)                                       | 6  |
| <b>Table 2.6</b>                             | Mean age by commodity and population group (2011)  | 7  |
| <b>Table 2.7</b>                             | Mean duration of service by commodity and population group (2011)  | 7  |
| <b>Table 3.1</b>                             | Number of cases and prevalence of active PTB by commodity and population group (2011)                                    | 9  |
| <b>Table 3.2</b>                             | Number of cases and prevalence of active PTB by age and population group (2011)  | 10 |
| <b>Table 4.1</b>                             | Number of cases and prevalence of silicosis by commodity and population group (2011)                                     | 11 |
| <b>Table 4.2</b>                             | Number of cases and prevalence of silicosis in the gold mining industry, by age and population group (2011)              | 12 |
| <b>Table 4.3</b>                             | Number of cases and prevalence of silicosis in the gold mining industry, by years of service and population group (2011) | 12 |

|                   |  |    |
|-------------------|--|----|
| <b>Table 5.1</b>  | Number of cases and prevalence of asbestosis by age and population group (2011)                | 13 |
| <b>Table 6.1</b>  | Number of cases and prevalence of emphysema by age and population group (2011)                 | 14 |
| <b>Table 6.2</b>  | Number of cases and prevalence of emphysema by commodity and population group (2011)           | 14 |
| <b>Table 6.3</b>  | Number of cases and prevalence of emphysema by years of service and population group (2011)    | 15 |
| <b>Table 7.1</b>  | Number and proportion of mesothelioma cases by age and population group (2011)                 | 16 |
| <b>Table 7.2</b>  | Number and proportion of mesothelioma cases by commodity and population group (2011)           | 16 |
| <b>Table 8.1</b>  | Number of cases and prevalence of primary lung cancer by age and population group (2011)       | 17 |
| <b>Table 8.2</b>  | Number of cases and prevalence of primary lung cancer by commodity and population group (2011) | 17 |
| <b>Table 9.1</b>  | Clinical causes of death by population group (2011)  | 18 |
| <b>Table 10.1</b> | Number and proportion of autopsies in women by age and population group (2011)                 | 19 |
| <b>Table 10.2</b> | Number and proportion of autopsies in women by commodity and population group (2011)           | 19 |
| <b>Table 10.3</b> | Number and proportion of diseases in women (2011)  | 20 |

## LIST OF FIGURES

|                   |   |    |
|-------------------|---|----|
| <b>Figure 1</b>   | Overall disease rates for 2011  | i  |
| <b>Figure 2.1</b> | Distribution of autopsies by age and population group (2011)                                | 4  |
| <b>Figure 2.2</b> | Distribution of autopsies by commodity and population group (2011)                          | 5  |
| <b>Figure 2.3</b> | Distribution of autopsies by years of service and population group (2011)                   | 6  |
| <b>Figure 3.1</b> | Distribution of active TB by site (2011)  | 8  |
| <b>Figure 3.2</b> | Active PTB rates in all black miners at autopsy (1975 to 2011)                              | 9  |
| <b>Figure 9.1</b> | Clinical cause of death as given by the clinicians who submit the organs to the NIOH (2011) | 18 |

## APPENDICES

|                    |   |    |
|--------------------|---|----|
| <b>Appendix 1:</b> | Distribution of autopsies according to the last mine where the deceased worked (2011) | 21 |
| <b>Appendix 2:</b> | Publications and activities emanating from PATHAUT Data (2011)                        | 26 |

## GLOSSARY

---

|  |   |
|--|---|
| <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 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

---

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 v9.2.

This report describes autopsy cases examined during the year 2011. In addition, in 2011 the Pathology Division produced a series of reports from 1975. 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 - 2011)**

| 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         | 1.0        | 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          |
| <b>Total</b>    | <b>71 364</b> | <b>68</b> | <b>33 921</b> | <b>32</b> | <b>1 592</b> | <b>2</b> | <b>3</b> |   | <b>325</b> | <b>0.3</b> | <b>105 395</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 133 543 in 2011.

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 2011. Autopsies of the cardio-respiratory organs only comprised 97.7% of all examinations.

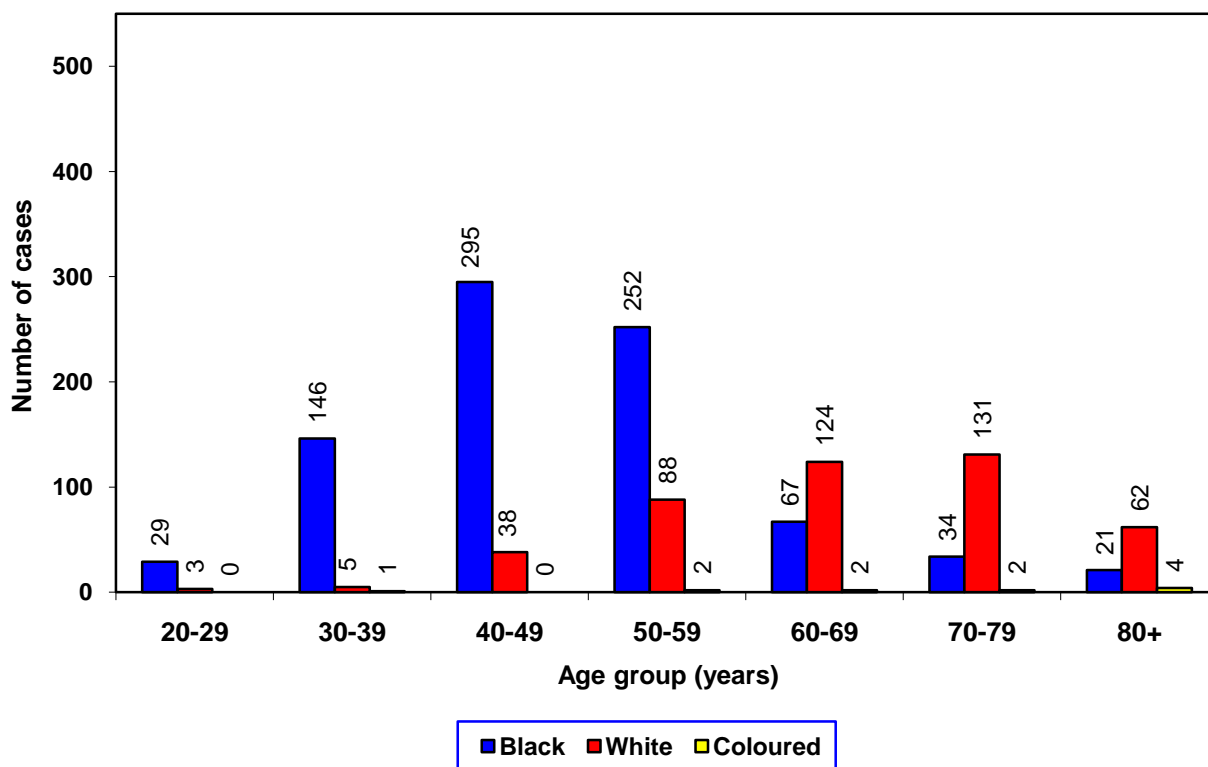
**TABLE 2-2 NUMBER AND PROPORTION OF AUTOPSIES BY TYPE AND POPULATION GROUP (2011)**

| Autopsy type                   | Black |       | White |      | Coloured |       | Unknown |       | Total |      |
|--------------------------------|-------|-------|-------|------|----------|-------|---------|-------|-------|------|
|                                | N     | %     | N     | %    | N        | %     | N       | %     | N     | %    |
| Cardio-respiratory organs only | 847   | 100.0 | 423   | 93.4 | 11       | 100.0 | 18      | 100.0 | 1 299 | 97.7 |
| Full autopsy                   | 0     | -     | 30    | 6.6  | 0        | -     | 0       | -     | 30    | 2.3  |
| Total                          | 847   |       | 453   |      | 11       |       | 18      |       | 1 329 |      |

The age distribution of cases for 2011 is shown in Table 2-3 and Figure 2-1. The mean age at autopsy of black men was 48.8 years, which was higher than in 2010 (46.4 years). The mean age of white men at autopsy was 65.9 years in 2011, which was similar to that in 2010 (66.0 years).

**TABLE 2-3 NUMBER AND PROPORTION OF AUTOPSIES BY AGE AND POPULATION GROUP (2011)**

| Age group<br>(years) | Black |      | White |      | Coloured |      | Unknown |       | Total |      |
|----------------------|-------|------|-------|------|----------|------|---------|-------|-------|------|
|                      | N     | %    | N     | %    | N        | %    | N       | %     | N     | %    |
| 20-29                | 29    | 3.4  | 3     | 0.7  | 0        | -    | 0       | -     | 32    | 2.4  |
| 30-39                | 146   | 17.2 | 5     | 1.1  | 1        | 9.0  | 0       | -     | 152   | 11.4 |
| 40-49                | 295   | 34.8 | 38    | 8.4  | 0        | -    | 0       | -     | 333   | 25.0 |
| 50-59                | 252   | 29.8 | 88    | 19.4 | 2        | 18.2 | 0       | -     | 342   | 25.7 |
| 60-69                | 67    | 7.9  | 124   | 27.4 | 2        | 18.2 | 0       | -     | 193   | 14.5 |
| 70-79                | 34    | 4.0  | 131   | 28.9 | 2        | 18.2 | 0       | -     | 167   | 12.6 |
| 80+                  | 21    | 2.5  | 62    | 13.7 | 4        | 36.4 | 0       | -     | 87    | 6.5  |
| Unknown              | 3     | 0.4  | 2     | 0.4  | 0        | -    | 18      | 100.0 | 23    | 1.7  |
| Total                | 847   |      | 453   |      | 11       |      | 18      |       | 1 329 |      |



**FIG 2-1 DISTRIBUTION OF AUTOPSIES BY AGE AND POPULATION GROUP (2011)**

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).

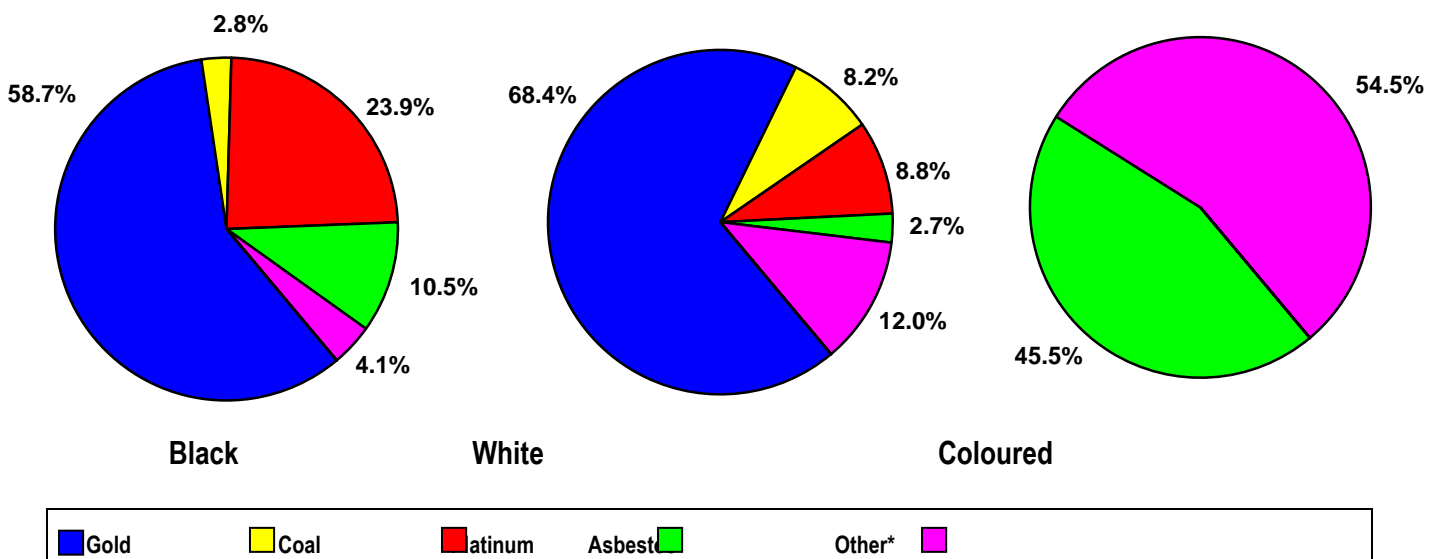
Since 2006, ‘environmental asbestos’ exposure has been recorded and is grouped under ‘other’ exposure in analyses. In 2011, cases with this exposure comprised of two whites, one coloured and four blacks.

Table 2-4 and Figure 2-2 show the distributions of autopsies by commodity and population group for 2011. Of the cases received, 60.7% were from the gold mining industry compared to 62.5% in 2010. The proportion of autopsies from the platinum industry has increased over the years, from 8.3% in 1999 to 18.2% in 2011. As in previous years, most of the coloured cases autopsied had been exposed to asbestos: 5 (45.5%) in the asbestos mines and 1 (9.1%) in the environment.

**TABLE 2-4 NUMBER AND PROPORTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (2011)**

| Commodity    | Black      |      | White      |      | Coloured  |      | Unknown   |      | Total        |      |
|--------------|------------|------|------------|------|-----------|------|-----------|------|--------------|------|
|              | N          | %    | N          | %    | N         | %    | N         | %    | N            | %    |
| Gold         | 497        | 58.7 | 310        | 68.4 | 0         | -    | 0         | -    | 807          | 60.7 |
| Platinum     | 202        | 23.9 | 40         | 8.8  | 0         | -    | 0         | -    | 242          | 18.2 |
| Coal         | 24         | 2.8  | 37         | 8.2  | 0         | -    | 0         | -    | 61           | 4.6  |
| Asbestos     | 89         | 10.5 | 12         | 2.7  | 5         | 45.5 | 4         | 22.2 | 110          | 8.3  |
| Iscor        | 1          | 0.1  | 17         | 3.8  | 0         | -    | 0         | -    | 18           | 1.4  |
| Diamond      | 5          | 0.6  | 6          | 1.3  | 0         | -    | 0         | -    | 11           | 0.8  |
| Copper       | 2          | 0.2  | 5          | 1.1  | 2         | 18.2 | 0         | -    | 9            | 0.7  |
| Manganese    | 11         | 1.3  | 0          | -    | 0         | -    | 0         | -    | 11           | 0.8  |
| Industry     | 0          | -    | 10         | 2.2  | 1         | 9.1  | 0         | -    | 11           | 0.8  |
| Other        | 9          | 1.1  | 13         | 2.9  | 3         | 27.3 | 0         | -    | 25           | 1.9  |
| Unknown      | 7          | 0.8  | 3          | 0.7  | 0         | -    | 14        | 77.8 | 24           | 1.8  |
| <b>Total</b> | <b>847</b> |      | <b>453</b> |      | <b>11</b> |      | <b>18</b> |      | <b>1 329</b> |      |

Note: this table shows only those commodities where a total of 9 or more cases were received



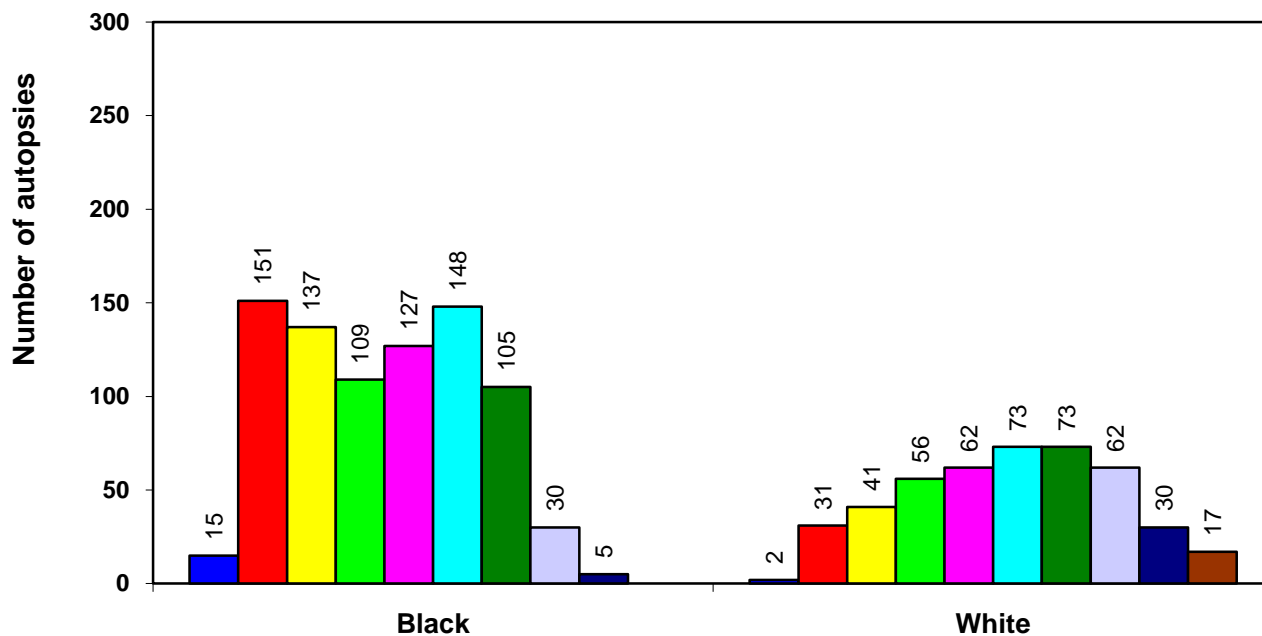
\* Includes copper, chrome, diamond, environmental asbestos, Eskom, industry, iron, Iscor, lime, manganese, phosphate, quarry, railways, silica, steel, tin, vanadium as well as cases where service histories could not be obtained

**FIG 2-2 DISTRIBUTION OF AUTOPSIES BY COMMODITY AND POPULATION GROUP (2011)**

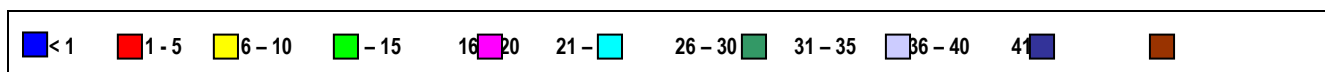
Detailed information about the years in mining service by population group is presented in Table 2-5 and Figure 2-3. In 2011, the duration of service was obtained for all but 3.4% of cases. This figure is similar to that for 2010 (3.1%).

**TABLE 2-5 NUMBER AND PROPORTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (2011)**

| Years of service | Black |      | White |      | Coloured |      | Unknown |       | Total |      |
|------------------|-------|------|-------|------|----------|------|---------|-------|-------|------|
|                  | N     | %    | N     | %    | N        | %    | N       | %     | N     | %    |
| <1               | 15    | 1.8  | 2     | 0.4  | 0        | -    | 0       | -     | 17    | 1.3  |
| 1-5              | 151   | 17.8 | 31    | 6.8  | 2        | 18.2 | 0       | -     | 184   | 13.8 |
| 6-10             | 137   | 16.2 | 41    | 9.0  | 2        | 18.2 | 0       | -     | 180   | 13.5 |
| 11-15            | 109   | 12.9 | 56    | 12.4 | 2        | 18.2 | 0       | -     | 167   | 12.6 |
| 16-20            | 127   | 15.0 | 62    | 13.7 | 2        | 18.2 | 0       | -     | 191   | 14.4 |
| 21-25            | 148   | 17.5 | 73    | 16.1 | 2        | 18.2 | 0       | -     | 223   | 16.8 |
| 26-30            | 105   | 12.4 | 73    | 16.1 | 0        | -    | 0       | -     | 178   | 13.4 |
| 31-35            | 30    | 3.5  | 62    | 13.7 | 0        | -    | 0       | -     | 92    | 6.9  |
| 36-40            | 5     | 0.6  | 30    | 6.6  | 0        | -    | 0       | -     | 35    | 2.6  |
| 41+              | 0     | -    | 17    | 3.8  | 0        | -    | 0       | -     | 17    | 1.3  |
| Unknown          | 20    | 2.4  | 6     | 1.3  | 1        | 9.1  | 18      | 100.0 | 45    | 3.4  |
| Total            | 847   |      | 453   |      | 11       |      | 18      |       | 1 329 |      |



Years of service:



**FIG 2-3 DISTRIBUTION OF AUTOPSIES BY YEARS OF SERVICE AND POPULATION GROUP (2011)**

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 (2011)**

| Commodity | Black |              |     | White |              |     |
|-----------|-------|--------------|-----|-------|--------------|-----|
|           | N     | Mean (years) | SD* | N     | Mean (years) | SD* |
| Gold      | 497   | 47           | 9   | 309   | 67           | 12  |
| Platinum  | 202   | 44           | 9   | 39    | 58           | 14  |
| Coal      | 24    | 50           | 11  | 37    | 66           | 13  |
| Asbestos  | 87    | 67           | 11  | 12    | 65           | 7   |
| Iscor     | 1     | 74           | -   | 17    | 73           | 7   |
| Diamond   | 5     | 68           | 14  | 6     | 66           | 11  |
| Copper    | 2     | 64           | 1.4 | 5     | 67           | 4   |
| Manganese | 11    | 61           | 14  | 0     | -            | -   |
| Industry  | 0     | -            | -   | 10    | 68           | 10  |
| Other     | 9     | 65           | 13  | 13    | 70           | 10  |
| Unknown   | 6     | 55           | 14  | 3     | 59           | 13  |
| Total     | 844   | 49           | 12  | 451   | 66           | 12  |

\* Standard deviation

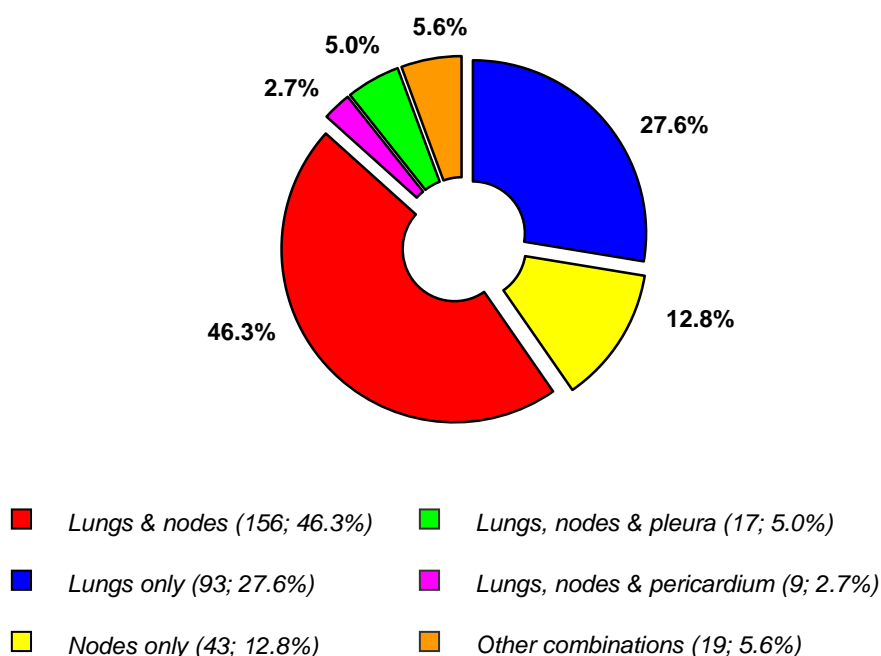
**TABLE 2-7 MEAN DURATION OF SERVICE BY COMMODITY AND POPULATION GROUP (2011)**

| Commodity | Black |              |     | White |              |     |
|-----------|-------|--------------|-----|-------|--------------|-----|
|           | N     | Mean (years) | SD* | N     | Mean (years) | SD* |
| Gold      | 496   | 18           | 9   | 310   | 25           | 10  |
| Platinum  | 201   | 13           | 8   | 40    | 17           | 10  |
| Coal      | 24    | 17           | 11  | 37    | 18           | 10  |
| Asbestos  | 82    | 9            | 8   | 12    | 12           | 6   |
| Iscor     | 1     | 18           | -   | 17    | 28           | 10  |
| Diamond   | 5     | 12           | 8   | 6     | 14           | 8   |
| Copper    | 2     | 6            | 2   | 5     | 14           | 10  |
| Manganese | 11    | 17           | 9   | 0     | -            | -   |
| Industry  | 0     | -            | -   | 9     | 16           | 11  |
| Other     | 5     | 23           | 5   | 11    | 24           | 11  |
| Total     | 827   | 16           | 9   | 447   | 23           | 11  |

\*Standard deviation

### SECTION 3 – ACTIVE TUBERCULOSIS

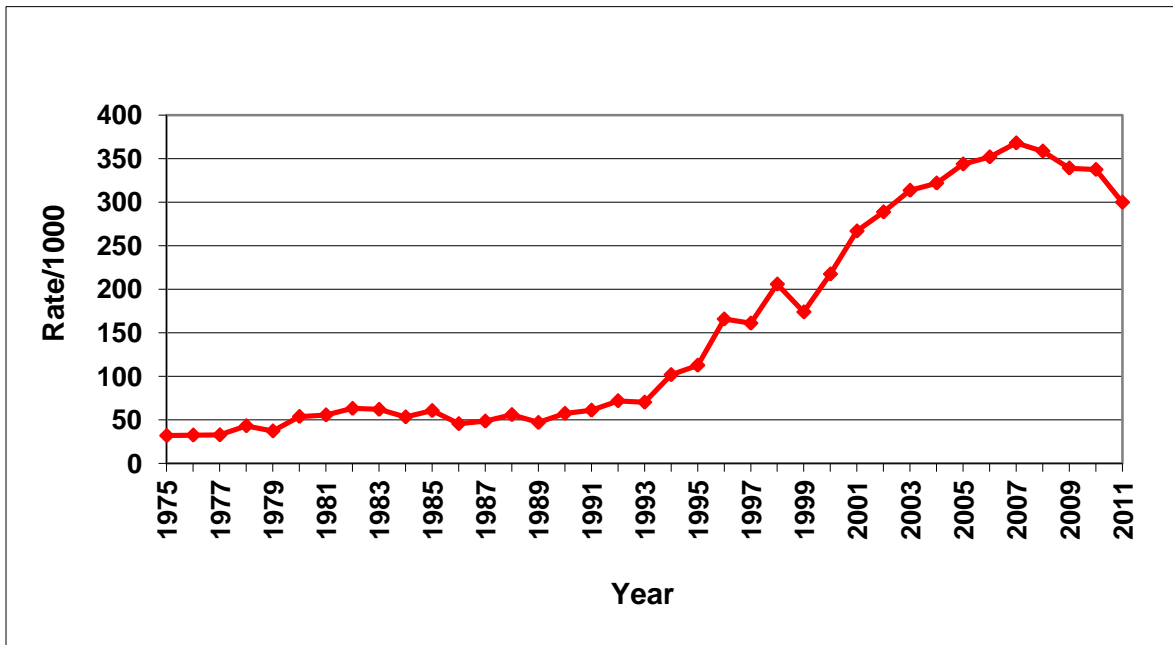
The distribution of active tuberculosis (TB) by anatomical site is presented in Figure 3-1 (n=337). Active pulmonary TB (PTB) was diagnosed in 21.6% (n=287) of all cases autopsied in 2011, compared to 16.4% (n=416) in 2000. Most of the men with PTB were black (n=254; 88.5%), 28 were white (9.8%), one was coloured (0.3%) and for 4 cases (1.4%) the population group was not known.



**FIG 3-1 DISTRIBUTION OF ACTIVE TB BY SITE (2011)**

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

In 2011, the overall PTB rate was 216/1000. In black miners, PTB rates increased from the early 1990s to 2007 and have declined annually to 300/1000 in 2011 (Fig 3-2). The rate in white men remains lower than that in black men, 62/1000 in 2011.



**FIG 3-2 ACTIVE PTB RATES IN BLACK MINERS AT AUTOPSY (1975 to 2011)**

The distribution of active PTB cases by commodity is shown in Table 3-1. Most cases of the active PTB (67.9%) were from the gold (60.7% of all autopsy cases came from that commodity) and platinum (18.8%) mining industries.

**TABLE 3-1 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY COMMODITY AND POPULATION GROUP (2011)**

| Age group (years) | Black |      | White |      | Coloured |      | Unknown |      | Total |      |
|-------------------|-------|------|-------|------|----------|------|---------|------|-------|------|
|                   | N     | Rate | N     | Rate | N        | Rate | N       | Rate | N     | Rate |
| Gold              | 172   | 346  | 23    | 74   | 0        | -    | 0       | -    | 195   | 242  |
| Platinum          | 53    | 262  | 1     | -    | 0        | -    | 0       | -    | 54    | 223  |
| Coal              | 4     | 167  | 1     | -    | 0        | -    | 0       | -    | 5     | -    |
| Asbestos          | 14    | 157  | 1     | -    | 1        | -    | 0       | -    | 16    | 145  |
| Iscor             | 0     | -    | 1     | -    | 0        | -    | 0       | -    | 1     | -    |
| Diamond           | 2     | -    | 1     | -    | 0        | -    | 0       | -    | 3     | -    |
| Copper            | 1     | -    | 0     | -    | 0        | -    | 0       | -    | 1     | -    |
| Manganese         | 4     | -    | 0     | -    | 0        | -    | 0       | -    | 4     | -    |
| Other             | 1     | -    | 0     | -    | 0        | -    | 0       | -    | 1     | -    |
| Unknown           | 3     | -    | 0     | -    | 0        | -    | 4       | -    | 7     | 292  |
| <b>Total</b>      | 254   | 300  | 28    | 62   | 1        |      | 4       |      | 287   | 216  |

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 of the PTB cases (n=105; 36.6%) were in the age group 40-49 years, followed by those in the 50-59 year age group (n=73; 25.4%).

**TABLE 3-2 NUMBER OF CASES AND PREVALENCE OF ACTIVE PTB BY AGE AND POPULATION GROUP (2011)**

| Age group (years) | Black |      | White |      | Coloured |      | Unknown |      | Total |      |
|-------------------|-------|------|-------|------|----------|------|---------|------|-------|------|
|                   | N     | Rate | N     | Rate | N        | Rate | N       | Rate | N     | Rate |
| 20-29             | 10    | 345  | 0     | -    | 0        | -    | 0       | -    | 10    | 313  |
| 30-39             | 56    | 384  | 0     | -    | 0        | -    | 0       | -    | 56    | 368  |
| 40-49             | 99    | 336  | 6     | 158  | 0        | -    | 0       | -    | 105   | 315  |
| 50-59             | 67    | 266  | 6     | 68   | 0        | -    | 0       | -    | 73    | 213  |
| 60-69             | 15    | 224  | 7     | 56   | 0        | -    | 0       | -    | 22    | 114  |
| 70-79             | 4     | -    | 3     | -    | 0        | -    | 0       | -    | 7     | 42   |
| 80+               | 2     | -    | 6     | 97   | 1        | -    | 0       | -    | 9     | 103  |
| Unknown           | 1     | -    | 0     | -    | 0        | -    | 4       | -    | 5     | -    |
| <b>Total</b>      | 254   | 300  | 28    | 62   | 1        |      | 4       |      | 287   | 216  |

Note: rates have not been calculated where numbers are small

## SECTION 4 – SILICOSIS

Silicotic nodules were found in the lungs of 300 cases (22.6% of all autopsies), 90.0% of which came from the gold mining industry. Of all cases of silicosis, occasional silicotic nodules were found in 140 (46.7%) of cases, a few in 70 (23.3%), a moderate number in 72 (24.0%) and a large number in 18 (6.0%).

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 (2011)**

| Age group (years) | Black |      | White |      | Coloured |      | Unknown |      | Total |      |
|-------------------|-------|------|-------|------|----------|------|---------|------|-------|------|
|                   | N     | Rate | N     | Rate | N        | Rate | N       | Rate | N     | Rate |
| Gold              | 180   | 362  | 90    | 290  | 0        | -    | 0       | -    | 270   | 335  |
| Platinum          | 6     | 30   | 0     | -    | 0        | -    | 0       | -    | 6     | 25   |
| Coal              | 1     | -    | 2     | 54   | 0        | -    | 0       | -    | 3     | -    |
| Asbestos          | 7     | 79   | 1     | 83   | 0        | -    | 1       | -    | 9     | 82   |
| Diamond           | 1     | -    | 1     | 167  | 0        | -    | 0       | -    | 2     | -    |
| Copper            | 0     | -    | 2     | 400  | 1        | -    | 0       | -    | 3     | -    |
| Manganese         | 1     | -    | 0     | -    | 0        | -    | 0       | -    | 1     | -    |
| Other             | 1     | -    | 0     | -    | 0        | -    | 0       | -    | 1     | -    |
| Unknown           | 3     | -    | 0     | -    | 0        | -    | 2       | -    | 5     | -    |
| <b>Total</b>      | 200   | 236  | 96    | 212  | 1        |      | 3       |      | 300   | 226  |

Note: rates have not been calculated where numbers are small

Silicosis in gold miners is shown in the following tables. The rate of silicosis in gold miners increased from 320/1000 in 2009 to 327/1000 in 2010 to 335/1000 in 2011. Although the silicosis rates increased with increasing age in both black and white men, the age distribution of cases differed between the two population groups (Table 4-2). In black men, silicosis was diagnosed among younger men (<40 years) (Table 4-2).

**TABLE 4-2 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLD MINING INDUSTRY, BY AGE AND POPULATION GROUP (2011)**

| Age group (years) | Black |      | White |      | Coloured |      | Unknown |      | Total |      |
|-------------------|-------|------|-------|------|----------|------|---------|------|-------|------|
|                   | N     | Rate | N     | Rate | N        | Rate | N       | Rate | N     | Rate |
| 30-39             | 9     | 114  | 0     | -    | 0        | -    | 0       | -    | 9     | 110  |
| 40-49             | 68    | 338  | 3     | -    | 0        | -    | 0       | -    | 71    | 314  |
| 50-59             | 84    | 497  | 20    | 323  | 0        | -    | 0       | -    | 104   | 450  |
| 60-69             | 13    | 650  | 20    | 238  | 0        | -    | 0       | -    | 33    | 317  |
| 70-79             | 3     | -    | 31    | 369  | 0        | -    | 0       | -    | 34    | 374  |
| 80+               | 3     | -    | 15    | 300  | 0        | -    | 0       | -    | 18    | 340  |
| Unknown           | 0     | -    | 1     | -    | 0        | -    | 0       | -    | 1     | -    |
| Total             | 180   | 362  | 90    | 290  | 0        |      | 0       |      | 270   | 335  |

Note: rates have not been calculated where numbers are small

**TABLE 4-3 NUMBER OF CASES AND PREVALENCE OF SILICOSIS IN THE GOLD MINING INDUSTRY, BY YEARS OF SERVICE AND POPULATION GROUP (2011)**

| Years of service | Black |      | White |      | Coloured |      | Unknown |      | Total |      |
|------------------|-------|------|-------|------|----------|------|---------|------|-------|------|
|                  | N     | Rate | N     | Rate | N        | Rate | N       | Rate | N     | Rate |
| 1-5              | 1     | -    | 3     | -    | 0        | -    | 0       | -    | 4     | -    |
| 6-10             | 10    | 167  | 3     | -    | 0        | -    | 0       | -    | 13    | 159  |
| 11-15            | 20    | 317  | 4     | -    | 0        | -    | 0       | -    | 24    | 250  |
| 16-20            | 34    | 395  | 13    | 317  | 0        | -    | 0       | -    | 47    | 370  |
| 21-25            | 55    | 482  | 14    | 286  | 0        | -    | 0       | -    | 69    | 423  |
| 26-30            | 36    | 468  | 27    | 435  | 0        | -    | 0       | -    | 63    | 453  |
| 31-35            | 20    | 769  | 12    | 245  | 0        | -    | 0       | -    | 32    | 427  |
| 36-40            | 4     | -    | 9     | 375  | 0        | -    | 0       | -    | 13    | 464  |
| >41              | 0     | -    | 5     | -    | 0        | -    | 0       | -    | 5     | -    |
| Total            | 180   | 362  | 90    | 290  | 0        |      | 0       |      | 270   | 335  |

Note: rates have not been calculated where numbers are small

## SECTION 5 – OTHER PNEUMOCONIOSES

### MASSIVE FIBROSIS

There were 32 (2.4%) cases of massive fibrosis (25 black, 6 white, 1 unknown). Twenty seven were from the gold mining industry, three were unknown and one each were from the asbestos and diamond industries.

### COAL WORKERS' PNEUMOCONIOSIS

There were 8 (0.6%) cases of coal workers' pneumoconiosis. Six were from the coal, one from manganese and for one case the industry was unknown.

### MIXED DUST PNEUMOCONIOSIS

There were 12 (0.9%) cases of mixed dust pneumoconiosis. Ten were from the gold, one from asbestos and one was from the platinum mining industry.

### ASBESTOSIS AND PLEURAL PLAQUES

There were 83 cases of asbestosis; higher than the number in 2010 (n=68). Of the asbestosis cases, 45.8% (n=38) had slight, 34.9% (n=29) moderate and 19.3% (n=16) marked fibrosis. Seventy four (89.2%) of these cases had worked in the asbestos mining industry at some time in their lives and two had been exposed to asbestos in the environment.

There were 68 cases with asbestos plaques and of these 36 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 (2011)**

| Age group (years) | Black |      | White |      | Coloured |      | Unknown |      | Total |      |
|-------------------|-------|------|-------|------|----------|------|---------|------|-------|------|
|                   | N     | Rate | N     | Rate | N        | Rate | N       | Rate | N     | Rate |
| 40-49             | 4     | -    | 0     | -    | 0        | -    | 0       | -    | 4     | -    |
| 50-59             | 8     | 32   | 0     | -    | 0        | -    | 0       | -    | 8     | 23   |
| 60-69             | 20    | 299  | 5     | -    | 1        | -    | 0       | -    | 26    | 135  |
| 70-79             | 23    | 676  | 3     | -    | 1        | -    | 0       | -    | 27    | 162  |
| 80+               | 10    | 476  | 1     | -    | 2        | -    | 0       | -    | 13    | 149  |
| Unknown           | 1     | -    | 0     | -    | 0        | -    | 4       | -    | 5     | -    |
| Total             | 66    | 78   | 9     | 20   | 4        |      | 4       |      | 83    | 62   |

Note: rates have not been calculated where numbers are small

## SECTION 6 – EMPHYSEMA

There were 351 cases of emphysema, the extent of which was mild in 74.6% (n=262), moderate in 20.5% (n=72) and marked in 4.8% (n=17). The overall rate of emphysema (264/1000) was higher than that in 2010 (250/1000). 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 (2011)**

| Age group (years) | Black      |            | White      |            | Coloured |          | Unknown  |          | Total      |            |
|-------------------|------------|------------|------------|------------|----------|----------|----------|----------|------------|------------|
|                   | N          | Rate       | N          | Rate       | N        | Rate     | N        | Rate     | N          | Rate       |
| 20-29             | 0          | -          | 1          | -          | 0        | -        | 0        | -        | 1          | -          |
| 30-39             | 7          | 48         | 0          | -          | 0        | -        | 0        | -        | 7          | 46         |
| 40-49             | 38         | 129        | 7          | 184        | 0        | -        | 0        | -        | 45         | 135        |
| 50-59             | 65         | 258        | 21         | 239        | 0        | -        | 0        | -        | 86         | 251        |
| 60-69             | 17         | 254        | 64         | 516        | 0        | -        | 0        | -        | 81         | 420        |
| 70-79             | 14         | 412        | 68         | 519        | 0        | -        | 0        | -        | 82         | 491        |
| 80+               | 12         | 571        | 28         | 452        | 3        | -        | 0        | -        | 43         | 494        |
| Unknown           | 1          | -          | 2          | -          | 0        | -        | 3        | -        | 6          | 261        |
| <b>Total</b>      | <b>154</b> | <b>182</b> | <b>191</b> | <b>424</b> | <b>3</b> | <b>-</b> | <b>3</b> | <b>-</b> | <b>351</b> | <b>264</b> |

Note: rates have not been calculated where numbers are small

Most of the black and white men with emphysema were from the gold mining industry (n=214, 60.9%) (Table 6-2).

**TABLE 6-2 NUMBER OF CASES AND PREVALENCE OF EMPHYSEMA BY COMMODITY AND POPULATION GROUP (2011)**

| Age group (years) | Black      |            | White      |            | Coloured |          | Unknown  |          | Total      |            |
|-------------------|------------|------------|------------|------------|----------|----------|----------|----------|------------|------------|
|                   | N          | Rate       | N          | Rate       | N        | Rate     | N        | Rate     | N          | Rate       |
| Gold              | 90         | 181        | 124        | 400        | 0        | -        | 0        | -        | 214        | 265        |
| Platinum          | 18         | 89         | 17         | 425        | 0        | -        | 0        | -        | 35         | 145        |
| Coal              | 5          | -          | 15         | 405        | 0        | -        | 0        | -        | 20         | 328        |
| Asbestos          | 27         | 303        | 6          | 500        | 2        | -        | 0        | -        | 35         | 318        |
| Iscor             | 0          | -          | 11         | 647        | 0        | -        | 0        | -        | 11         | 611        |
| Diamond           | 4          | -          | 3          | -          | 0        | -        | 0        | -        | 7          | 636        |
| Copper            | 1          | -          | 3          | -          | 1        | -        | 0        | -        | 5          | -          |
| Manganese         | 5          | -          | 0          | -          | 0        | -        | 0        | -        | 5          | -          |
| Industry          | 0          | -          | 5          | -          | 0        | -        | 0        | -        | 5          | -          |
| Other             | 1          | -          | 6          | 462        | 0        | -        | 0        | -        | 7          | 280        |
| Unknown           | 3          | -          | 1          | -          | 0        | -        | 3        | -        | 7          | 250        |
| <b>Total</b>      | <b>154</b> | <b>182</b> | <b>191</b> | <b>422</b> | <b>3</b> | <b>-</b> | <b>3</b> | <b>-</b> | <b>351</b> | <b>264</b> |

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 (2011)**

| Years of service | Black      |            | White      |            | Coloured |      | Unknown  |      | Total      |            |
|------------------|------------|------------|------------|------------|----------|------|----------|------|------------|------------|
|                  | N          | Rate       | N          | Rate       | N        | Rate | N        | Rate | N          | Rate       |
| <1               | 4          | -          | 1          | -          | 0        | -    | 0        | -    | 5          | -          |
| 1 - 5            | 17         | 113        | 9          | 290        | 0        | -    | 0        | -    | 26         | 141        |
| 6-10             | 24         | 175        | 14         | 341        | 0        | -    | 0        | -    | 38         | 211        |
| 11-15            | 19         | 174        | 22         | 393        | 0        | -    | 0        | -    | 41         | 246        |
| 16-20            | 19         | 150        | 25         | 403        | 1        | -    | 0        | -    | 45         | 236        |
| 21-25            | 32         | 216        | 30         | 411        | 2        | -    | 0        | -    | 64         | 287        |
| 26-30            | 24         | 229        | 34         | 466        | 0        | -    | 0        | -    | 58         | 326        |
| 31-35            | 6          | 200        | 31         | 500        | 0        | -    | 0        | -    | 37         | 402        |
| 36-40            | 1          | -          | 16         | 533        | 0        | -    | 0        | -    | 17         | 486        |
| 41+              | 0          | -          | 8          | 471        | 0        | -    | 0        | -    | 8          | 471        |
| Unknown          | 8          | 400        | 1          | -          | 0        | -    | 3        | -    | 12         | 267        |
| <b>Total</b>     | <b>154</b> | <b>182</b> | <b>191</b> | <b>422</b> | <b>3</b> |      | <b>3</b> |      | <b>351</b> | <b>264</b> |

Note: rates have not been calculated where numbers are small

## SECTION 7 – MESOTHELIOMA

There were 35 of cases of mesothelioma in 2011.

**TABLE 7-1 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY AGE AND POPULATION GROUP (2011)**

| Age group (years) | Black     |      | White    |      | Coloured |      | Unknown  |       | Total     |      |
|-------------------|-----------|------|----------|------|----------|------|----------|-------|-----------|------|
|                   | N         | %    | N        | %    | N        | %    | N        | %     | N         | %    |
| 40-49             | 1         | 4.0  | 0        | -    | 0        | -    | 0        | -     | 1         | 2.9  |
| 50-59             | 7         | 28.0 | 1        | 20.0 | 1        | 50.0 | 0        | -     | 9         | 25.7 |
| 60-69             | 9         | 36.0 | 1        | 20.0 | 0        | -    | 0        | -     | 10        | 28.6 |
| 70-79             | 4         | 16.0 | 2        | 40.0 | 1        | 50.0 | 0        | -     | 7         | 20.0 |
| 80+               | 3         | 12.0 | 1        | 20.0 | 0        | -    | 0        | -     | 4         | 11.4 |
| Unknown           | 1         | 4.0  | 0        | -    | 0        | -    | 3        | 100.0 | 4         | 11.4 |
| <b>Total</b>      | <b>25</b> |      | <b>5</b> |      | <b>2</b> |      | <b>3</b> |       | <b>35</b> |      |

The distribution of mesothelioma by commodity and population group is presented in Table 7.2. Twenty four (68.6%) of the cases had worked in asbestos mines at some stage in their careers and two (5.7%) had been exposed to asbestos in the environment.

**TABLE 7-2 NUMBER AND PROPORTION OF MESOTHELIOMA CASES BY COMMODITY AND POPULATION GROUP (2011)**

| Commodity    | Black     |      | White    |            | Coloured |            | Unknown  |      | Total     |      |
|--------------|-----------|------|----------|------------|----------|------------|----------|------|-----------|------|
|              | N         | %    | N        | %          | N        | %          | N        | %    | N         | %    |
| Asbestos     | 14        | 56.0 | 1        | 20.0       | 1        | 50.0       | 2        | 66.7 | 18        | 51.4 |
| Gold         | 1         | 4.0  | 1        | 20.0       | 0        | -          | 0        | -    | 2         | 5.7  |
| Platinum     | 4         | 16.0 | 0        | -          | 0        | -          | 0        | -    | 4         | 11.4 |
| Diamond      | 1         | 4.0  | 0        | -          | 0        | -          | 0        | -    | 1         | 2.9  |
| Copper       | 2         | 8.0  | 0        | -          | 0        | -          | 0        | -    | 2         | 5.7  |
| Manganese    | 1         | 4.0  | 0        | -          | 0        | -          | 0        | -    | 1         | 2.9  |
| Industry     | 0         | -    | 2        | 40.0       | 1        | 50.0       | 0        | -    | 3         | 8.6  |
| Other        | 2         | 8.0  | 1        | 20.0       | 0        | -          | 0        | -    | 3         | 8.6  |
| Unknown      | 0         | -    | 0        | -          | 0        | -          | 1        | 33.3 | 1         | 2.9  |
| <b>Total</b> | <b>25</b> |      | <b>5</b> | <b>100</b> | <b>2</b> | <b>100</b> | <b>3</b> |      | <b>35</b> |      |

## SECTION 8 – PRIMARY LUNG CANCER

Fifty six cases of primary lung cancer were found at autopsy, 27.7% of which were in black, 69.2% in white and 3.1% in coloured men. Most of the cases were large cell lung carcinomas (n = 19; 33.9%), followed by squamous cell lung carcinomas (n = 16; 28.6%), adenocarcinomas (n = 15; 36.8%), small cell lung carcinomas (n = 5; 8.9%) and one (1.8%) broncho-alveolar carcinoma.

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

**TABLE 8-1 NUMBER OF CASES AND PREVALENCE OF PRIMARY LUNG CANCER BY AGE AND POPULATION GROUP (2011)**

| Commodity    | Black     |           | White     |           | Coloured |           | Unknown  |      | Total     |           |
|--------------|-----------|-----------|-----------|-----------|----------|-----------|----------|------|-----------|-----------|
|              | N         | Rate      | N         | Rate      | N        | Rate      | N        | Rate | N         | Rate      |
| 40-49        | 3         | 10        | 0         | -         | 0        | -         | 0        | -    | 3         | -         |
| 50-59        | 11        | 44        | 4         | 45        | 1        | 500       | 0        | -    | 16        | 47        |
| 60-69        | 3         | 45        | 8         | 65        | 0        | -         | 0        | -    | 11        | 57        |
| 70-79        | 4         | 118       | 10        | 76        | 0        | -         | 0        | -    | 14        | 84        |
| 80+          | 1         | 48        | 8         | 129       | 0        | -         | 0        | -    | 9         | 103       |
| Unknown      | 0         | -         | 0         | -         | 0        | -         | 3        | -    | 3         | -         |
| <b>Total</b> | <b>22</b> | <b>26</b> | <b>30</b> | <b>66</b> | <b>1</b> | <b>91</b> | <b>3</b> |      | <b>56</b> | <b>42</b> |

Note: rates have not been calculated where numbers are small

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 (2011)**

| Age group (years) | Black     |           | White     |           | Coloured |      | Unknown  |      | Total     |           |
|-------------------|-----------|-----------|-----------|-----------|----------|------|----------|------|-----------|-----------|
|                   | N         | Rate      | N         | Rate      | N        | Rate | N        | Rate | N         | Rate      |
| Gold              | 6         | 12        | 24        | 77        | 0        | -    | 0        | -    | 30        | 37        |
| Platinum          | 5         | -         | 0         | -         | 0        | -    | 0        | -    | 5         | -         |
| Coal              | 0         | -         | 3         | -         | 0        | -    | 0        | -    | 3         | -         |
| Asbestos          | 7         | 79        | 0         | -         | 1        | -    | 1        | -    | 9         | 82        |
| Iscor             | 1         | -         | 0         | -         | 0        | -    | 0        | -    | 1         | -         |
| Diamond           | 0         | -         | 1         | -         | 0        | -    | 0        | -    | 1         | -         |
| Manganese         | 1         | -         | 0         | -         | 0        | -    | 0        | -    | 1         | -         |
| Industry          | 0         | -         | 1         | -         | 0        | -    | 0        | -    | 1         | -         |
| Other             | 2         | -         | 1         | -         | 0        | -    | 0        | -    | 3         | -         |
| Unknown           | 0         | -         | 0         | -         | 0        | -    | 2        | -    | 2         | -         |
| <b>Total</b>      | <b>22</b> | <b>26</b> | <b>30</b> | <b>66</b> | <b>1</b> |      | <b>3</b> |      | <b>56</b> | <b>42</b> |

Note: rates have not been calculated where numbers are small

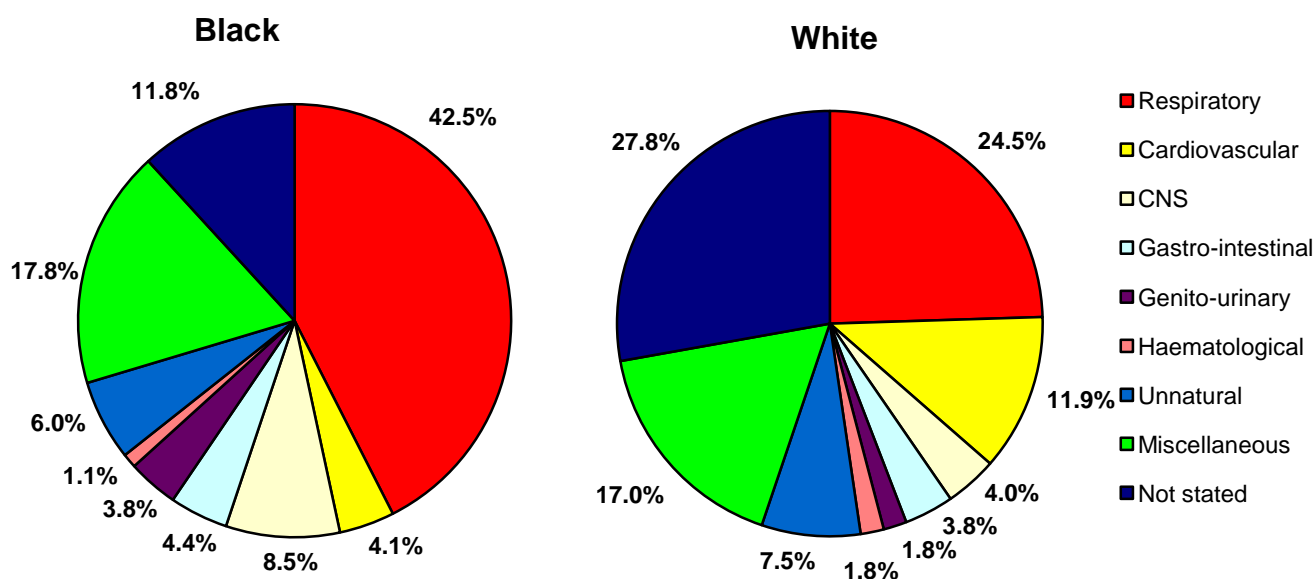


## SECTION 9 – CLINICAL CAUSE OF DEATH

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 (35.7% overall). The proportion of unnatural deaths remained unchanged: 5.7% in 2010 and 6.4% in 2011. The clinical cause of death was not stated in 18.4% of cases.

**TABLE 9-1 CLINICAL CAUSE OF DEATH BY POPULATION GROUP (2011)**

| System                 | Black      |      | White      |      | Coloured  |      | Unknown   |       | Total       |      |
|------------------------|------------|------|------------|------|-----------|------|-----------|-------|-------------|------|
|                        | N          | %    | N          | %    | N         | %    | N         | %     | N           | %    |
| Respiratory            | 360        | 42.5 | 111        | 24.5 | 4         | 36.4 | 0         | -     | 475         | 35.7 |
| Cardio-vascular        | 35         | 4.1  | 54         | 11.9 | 0         | -    | 0         | -     | 89          | 6.7  |
| Central Nervous System | 72         | 8.5  | 18         | 4.0  | 1         | 9.1  | 0         | -     | 91          | 6.8  |
| Gastro-intestinal      | 37         | 4.4  | 17         | 3.8  | 0         | -    | 0         | -     | 54          | 4.1  |
| Genito-urinary         | 32         | 3.8  | 8          | 1.8  | 0         | -    | 0         | -     | 40          | 3.0  |
| Haematological         | 9          | 1.1  | 8          | 1.8  | 0         | -    | 0         | -     | 17          | 1.3  |
| Unnatural              | 51         | 6.0  | 34         | 7.5  | 0         | -    | 0         | -     | 85          | 6.4  |
| Miscellaneous          | 151        | 17.8 | 77         | 17.0 | 5         | 45.5 | 0         | -     | 233         | 17.5 |
| Not stated             | 100        | 11.8 | 126        | 27.8 | 1         | 9.1  | 18        | 100.0 | 245         | 18.4 |
| <b>Total</b>           | <b>847</b> |      | <b>453</b> |      | <b>11</b> |      | <b>18</b> |       | <b>1329</b> |      |



**FIGURE 9-1 CLINICAL CAUSE OF DEATH (2011)**

## SECTION 10 – AUTOPSY FINDINGS IN WOMEN

Of the 1 329 cases examined in 2011, 45 (3.4%) were women, compared to 32 (2.1%) in 2010. Of these, 40 (88.9%) were black, 2 (4.4%) were white and 3 (6.7%) were coloured. The women were, on average, older than the men (59.2 years versus 54.8 years).

**TABLE 10.1 NUMBER AND PROPORTION OF AUTOPSIES IN WOMEN BY AGE AND POPULATION GROUP (2011)**

| Age group (years) | Black |      | White |      | Coloured |      | Total |      |
|-------------------|-------|------|-------|------|----------|------|-------|------|
|                   | N     | %    | N     | %    | N        | %    | N     | %    |
| 20-29             | 4     | 10.0 | 0     | -    | 0        | -    | 4     | 8.9  |
| 30-39             | 8     | 20.0 | 0     | -    | 0        | -    | 8     | 17.8 |
| 40-49             | 3     | 7.5  | 0     | -    | 0        | -    | 3     | 6.6  |
| 50-59             | 5     | 12.5 | 0     | -    | 0        | -    | 5     | 11.1 |
| 60-69             | 10    | 25.0 | 1     | 50.0 | 0        | -    | 11    | 24.4 |
| 70-79             | 3     | 7.5  | 0     | -    | 1        | 33.3 | 4     | 8.9  |
| 80+               | 7     | 17.5 | 1     | 50.0 | 2        | 66.6 | 10    | 22.2 |
| Total             | 40    |      | 2     |      | 3        |      | 45    |      |

Table 10.2 summarises the distribution of autopsies in women by commodity and population group. Most of the women (29 cases; 64.4%) had been exposed to asbestos, with 23 (79.3%) of these exposed on the mines and 6 (20.7%) having had environmental exposure.

**TABLE 10.2 NUMBER AND PROPORTION OF AUTOPSIES IN WOMEN BY COMMODITY AND POPULATION GROUP (2011)**

| Commodity              | Black |      | White |       | Coloured |      | Total |      |
|------------------------|-------|------|-------|-------|----------|------|-------|------|
|                        | N     | %    | N     | %     | N        | %    | N     | %    |
| Gold                   | 9     | 22.5 | 0     | -     | 0        | -    | 9     | 20.0 |
| Platinum               | 7     | 17.5 | 0     | -     | 0        | -    | 7     | 15.6 |
| Coal                   | 0     | -    | 0     | -     | 0        | -    | 0     | -    |
| Asbestos               | 21    | 52.5 | 0     | -     | 2        | 66.6 | 23    | 51.1 |
| Environmental asbestos | 3     | 7.5  | 2     | 100.0 | 1        | 33.3 | 6     | 13.3 |
| Unknown                | 0     | -    | 0     | -     | 0        | -    | 0     | -    |
| Total                  | 40    |      | 2     |       | 3        |      | 45    |      |

There were 8 cases of asbestosis and 5 of mesothelioma (Table 10.3).

**TABLE 10.3 NUMBER AND PROPORTION OF DISEASES IN WOMEN (2011)**

| <b>Disease</b>  | <b>N</b> | <b>%</b> |
|-----------------|----------|----------|
| PTB             | 7        | 15.6     |
| Silicosis       | 1        | 2.2      |
| Emphysema       | 7        | 15.6     |
| Asbestosis      | 8        | 17.8     |
| Mesothelioma    | 5        | 11.1     |
| Lung cancer     | 5        | 11.1     |
| No lung disease | 12       | 26.7     |
| Total           | 45       |          |

**APPENDIX 1: DISTRIBUTION OF AUTOPSIES ACCORDING TO THE LAST MINE WHERE THE DECEASED WORKED (2011)**

| <b>Commodity</b>                 | <b>Last mine worked</b>     | <b>Black</b> | <b>White</b> | <b>Coloured</b> | <b>Unknown</b> | <b>Total</b> |
|----------------------------------|-----------------------------|--------------|--------------|-----------------|----------------|--------------|
| <b>Asbestos</b>                  | African Chrysotile Asbestos |              | 3            |                 |                | 3            |
|                                  | Bewaarkloof Asbestos Mine   |              | 1            |                 |                | 1            |
|                                  | Cape Blue                   | 8            |              | 1               |                | 9            |
|                                  | Chamber of Mines            |              |              | 1               |                | 1            |
|                                  | Danielskuil Asbestos Mine   | 4            |              |                 |                | 4            |
|                                  | Gefco                       | 46           | 1            |                 |                | 47           |
|                                  | Koegas                      | 4            | 1            | 1               |                | 6            |
|                                  | Penge Asbestos              | 1            | 1            |                 |                | 2            |
|                                  | Pomfret Asbestos Mine       | 6            |              |                 |                | 6            |
|                                  | Wandrag Asbestos Mine       | 2            | 2            |                 |                | 4            |
| <b>Total from asbestos mines</b> |                             | <b>71</b>    | <b>9</b>     | <b>3</b>        | <b>0</b>       | <b>83</b>    |
| <b>Cementation</b>               | Cementation                 |              | 4            |                 |                | 4            |
| <b>Chrome</b>                    | Chrome Mine                 | 1            | 3            |                 |                | 4            |
|                                  | Dilokong Chrome Mine        |              | 1            |                 |                | 1            |
|                                  | Samancor Western Chrome     | 1            |              |                 |                | 1            |
| <b>Total from chrome mines</b>   |                             | <b>2</b>     | <b>4</b>     | <b>0</b>        | <b>0</b>       | <b>6</b>     |
| <b>Coal</b>                      | Amcoal Colliery             |              | 1            |                 |                | 1            |
|                                  | Arnot Colliery              | 3            | 1            |                 |                | 4            |
|                                  | Coal Mine                   | 1            | 1            |                 |                | 2            |
|                                  | Delmas Colliery             |              | 2            |                 |                | 2            |
|                                  | Douglas Colliery            |              | 2            |                 |                | 2            |
|                                  | Duiker Colliery             | 2            |              |                 |                | 2            |
|                                  | Durban Navigation Colliery  |              | 1            |                 |                | 1            |
|                                  | Ermelo Coal                 |              | 1            |                 |                | 1            |
|                                  | Goedehoop Colliery          | 1            | 2            |                 |                | 3            |
|                                  | Greenside Colliery          | 2            | 1            |                 |                | 3            |
|                                  | Khutala Colliery            |              | 2            |                 |                | 2            |
|                                  | Kleinkopje Colliery         | 1            |              |                 |                | 1            |
|                                  | Koornfontein Coal           |              | 1            |                 |                | 1            |
|                                  | Matla Coal                  | 12           | 3            |                 |                | 15           |

| Commodity                       | Last mine worked                | Black     | White     | Coloured | Unknown  | Total     |
|---------------------------------|---------------------------------|-----------|-----------|----------|----------|-----------|
| Coal (continued)                | New Denmark                     | 1         | 3         |          |          | 4         |
|                                 | New Largo Colliery              |           | 1         |          |          | 1         |
|                                 | Newcastle Coal Mine             |           | 1         |          |          | 1         |
|                                 | Nyati Coal Mine                 |           | 1         |          |          | 1         |
|                                 | Optimum Colliery                |           | 1         |          |          | 1         |
|                                 | Rietspruit Colliery             |           | 2         |          |          | 2         |
|                                 | S A Coal Estates                |           | 1         |          |          | 1         |
|                                 | Sasol Coal Mine                 |           | 3         |          |          | 3         |
|                                 | Spitzkop Colliery               |           | 1         |          |          | 1         |
|                                 | Springbok Colliery              |           | 1         |          |          | 1         |
|                                 | Springfield Colliery            | 1         |           |          |          | 1         |
|                                 | Tavistock Colliery              |           | 3         |          |          | 3         |
|                                 | Usutu Colliery                  |           | 1         |          |          | 1         |
|                                 | Vryheid Coronation Colliery     |           | 1         |          |          | 1         |
| <b>Total from coal mines</b>    |                                 | <b>25</b> | <b>38</b> | <b>0</b> | <b>0</b> | <b>63</b> |
| <b>Copper</b>                   | Copper Mine                     | 1         | 2         |          |          | 3         |
|                                 | O'Kiep Copper                   |           | 2         | 1        |          | 3         |
|                                 | Phalaborwa                      |           | 1         |          |          | 1         |
|                                 | Prieska                         | 3         |           |          |          | 3         |
| <b>Total from copper mines</b>  |                                 | <b>4</b>  | <b>5</b>  | <b>1</b> | <b>0</b> | <b>10</b> |
| <b>Diamond</b>                  | Bellsbank Diamond Mine          |           | 1         |          |          | 1         |
|                                 | De Beers Consolidated           | 2         | 4         |          |          | 6         |
|                                 | Diamond Mine                    | 3         | 1         |          |          | 4         |
|                                 | Finch Diamond Mine              | 2         |           |          |          | 2         |
| <b>Total from diamond mines</b> |                                 | <b>7</b>  | <b>6</b>  | <b>0</b> | <b>0</b> | <b>13</b> |
| <b>Gold</b>                     | African Rainbow Minerals & Expl |           | 1         |          |          | 1         |
|                                 | Anglogold Ashanti GM            | 2         | 3         |          |          | 5         |
|                                 | Barberton GM                    |           | 1         |          |          | 1         |
|                                 | Beatrix GM                      | 42        | 4         |          |          | 46        |
|                                 | Blyvooruitzicht                 | 2         | 9         |          |          | 11        |
|                                 | Bracken Mines                   |           | 2         |          |          | 2         |
|                                 | Buffelsfontein Gold             | 1         | 13        |          |          | 14        |
|                                 | Consolidated Main Reef          |           | 1         |          |          | 1         |

| Commodity        | Last mine worked            | Black | White | Coloured | Unknown | Total |
|------------------|-----------------------------|-------|-------|----------|---------|-------|
| Gold (continued) | Consolidated Murchison      |       | 1     |          |         | 1     |
|                  | Crown Mines                 |       | 2     |          |         | 2     |
|                  | Deelkraal                   |       | 3     |          |         | 3     |
|                  | Doomfontein                 |       | 3     |          |         | 3     |
|                  | Driefontein Consolidated GM | 18    | 3     |          |         | 21    |
|                  | Durban Roodepoort Deep      | 1     | 12    |          |         | 13    |
|                  | East Driefontein            | 3     | 5     |          |         | 8     |
|                  | East Rand Prop              |       | 7     |          |         | 7     |
|                  | Elandsrand                  |       | 5     |          |         | 5     |
|                  | Elsburg GM                  |       | 2     |          |         | 2     |
|                  | Evander GM                  | 5     | 2     |          |         | 7     |
|                  | Ezulwini GM                 | 14    | 2     |          |         | 16    |
|                  | Free State Geduld           | 3     | 8     |          |         | 11    |
|                  | Free State Saaiplaas        | 1     | 2     |          |         | 3     |
|                  | Gencor                      | 3     | 1     |          |         | 4     |
|                  | Gold Mine                   |       | 3     |          |         | 3     |
|                  | Goldfields                  | 1     | 3     |          |         | 4     |
|                  | Grinaker GM                 |       | 1     |          |         | 1     |
|                  | Grootvlei Prop              |       | 5     |          |         | 5     |
|                  | Harmony                     | 238   | 20    |          |         | 258   |
|                  | Hartebeesfontein            | 2     | 9     | 1        |         | 12    |
|                  | J.C.I. Gold Mine            | 1     | 2     |          |         | 3     |
|                  | Joel                        |       | 1     |          |         | 1     |
|                  | Kinross                     | 1     | 4     |          |         | 5     |
|                  | Kloof                       | 10    | 16    |          |         | 26    |
|                  | Leslie                      |       | 1     |          |         | 1     |
|                  | Libanon                     |       | 3     |          |         | 3     |
|                  | Lorraine                    |       | 1     |          |         | 1     |
|                  | Luipaardsvlei Estate GM     | 1     |       |          |         | 1     |
|                  | Modderfontein               | 1     |       |          |         | 1     |
|                  | Nigel GM                    |       | 1     |          |         | 1     |
|                  | Oryx                        | 10    |       |          |         | 10    |
|                  | President Brand             |       | 6     |          |         | 6     |
|                  | President Steyn             | 2     | 9     |          |         | 11    |
|                  | Protec GM                   |       | 1     |          |         | 1     |
|                  | Rand Leases                 | 1     |       |          |         | 1     |

| Commodity                         | Last mine worked                  | Black      | White      | Coloured | Unknown  | Total      |
|-----------------------------------|-----------------------------------|------------|------------|----------|----------|------------|
| Gold (continued)                  | Rand Mines                        |            | 1          |          |          | 1          |
|                                   | Rand Uranium GM                   | 6          |            |          |          | 6          |
|                                   | Randfontein                       | 1          | 12         |          |          | 13         |
|                                   | S A Land                          |            | 1          |          |          | 1          |
|                                   | Saaiplaas GM                      |            | 1          |          |          | 1          |
|                                   | Simmer & Jack GM                  | 28         | 2          |          |          | 30         |
|                                   | South Deep GM                     | 1          | 1          |          |          | 2          |
|                                   | St Helena                         |            | 2          |          |          | 2          |
|                                   | Stilfontein                       | 1          | 9          |          |          | 10         |
|                                   | Sub Nigel                         |            | 1          |          |          | 1          |
|                                   | Vaal Reefs                        | 61         | 35         |          |          | 96         |
|                                   | Venterspost                       |            | 1          |          |          | 1          |
|                                   | Virginia GM                       |            | 1          |          |          | 1          |
|                                   | Vlakfontein                       |            | 1          |          |          | 1          |
|                                   | Welkom GM                         | 1          | 1          |          |          | 2          |
|                                   | West Driefontein                  | 1          | 13         |          |          | 14         |
|                                   | West Rand Consolidated            |            | 4          |          |          | 4          |
|                                   | Western Areas                     | 1          | 7          |          |          | 8          |
|                                   | Western Deep Levels               | 5          | 10         |          |          | 15         |
|                                   | Western Holdings                  | 3          | 1          |          |          | 4          |
|                                   | Western Reef GM                   |            | 1          |          |          | 1          |
| <b>Total from gold mines</b>      |                                   | <b>472</b> | <b>283</b> | <b>1</b> | <b>0</b> | <b>756</b> |
| <b>Iron</b>                       | Beeshoek                          | 1          |            |          |          | 1          |
|                                   | Sishen Iron Mine                  | 2          |            |          |          | 2          |
| <b>Lime</b>                       | Union Lime                        | 2          |            | 1        |          | 3          |
|                                   | Idwala Lime                       |            |            | 2        |          | 2          |
| <b>Manganese</b>                  | Associated Manganese              | 5          |            |          |          | 5          |
|                                   | S A Manganese                     | 2          |            |          |          | 2          |
|                                   | Manganese Mine                    | 1          |            |          |          | 1          |
|                                   | Hotazel Manganese Mine            | 3          |            |          |          | 3          |
| <b>Total from manganese mines</b> |                                   | <b>11</b>  | <b>0</b>   | <b>0</b> | <b>0</b> | <b>11</b>  |
| <b>Platinum</b>                   | Amandelbult Platinum (Rustenburg) | 3          |            |          |          | 3          |
|                                   | Bafokeng                          | 1          | 1          |          |          | 2          |
|                                   | Eastern Platinum Mine             | 39         | 1          |          |          | 40         |

| Commodity                            | Last mine worked               | Black      | White      | Coloured  | Unknown   | Total        |
|--------------------------------------|--------------------------------|------------|------------|-----------|-----------|--------------|
|                                      | Impala Platinum                | 87         | 23         |           |           | 110          |
| Platinum<br>(continued)              | Karee Platinum                 | 17         |            |           |           | 17           |
|                                      | Lebowa Platinum Mine           | 2          | 1          |           |           | 3            |
|                                      | Lonmin Platinum                | 5          | 3          |           |           | 8            |
|                                      | Northam Platinum               | 13         | 7          |           |           | 20           |
|                                      | Rustenburg Platinum            | 18         | 20         |           | 8         | 46           |
|                                      | Unknown Platinum               |            | 2          |           |           | 2            |
|                                      | Western Platinum               | 42         | 2          |           |           | 44           |
|                                      | Wildebeestfontein              | 1          | 2          |           |           | 3            |
| <b>Total from<br/>platinum mines</b> |                                | <b>228</b> | <b>62</b>  | <b>0</b>  | <b>8</b>  | <b>298</b>   |
| <b>Quarries</b>                      | Quarry Mine                    | 1          |            |           |           | 1            |
| <b>Refinery</b>                      | Rustenburg Base Metal Refiners |            | 2          |           |           | 2            |
| <b>Shaft sinkers</b>                 | Shaft Sinkers                  | 1          |            |           |           | 1            |
|                                      | Master Drilling                |            | 1          |           |           | 1            |
| <b>Silicon</b>                       | Silicon Smelters               | 1          | 2          |           |           | 3            |
| <b>Steel &amp; Iron</b>              | Iskor                          |            | 17         |           |           | 17           |
| <b>Steel &amp; Vanadium</b>          | Highveld Steel and Vanadium    |            | 2          |           |           | 2            |
| <b>Tin</b>                           | Rooiberg Tin Mine              |            | 1          |           |           | 1            |
| <b>Vanadium</b>                      | Rhovon Vanadium Mine           |            |            | 1         |           | 1            |
| <b>Non-Miner</b>                     | Environmental asbestos         | 4          | 2          | 1         |           | 7            |
|                                      | Eskom                          |            | 3          |           |           | 3            |
|                                      | Industry                       |            | 6          | 1         |           | 7            |
|                                      | Transnet                       |            | 1          |           |           | 1            |
| <b>Total for non-miners</b>          |                                | <b>4</b>   | <b>12</b>  | <b>2</b>  | <b>0</b>  | <b>18</b>    |
| <b>Unknown</b>                       | Unknown                        | 15         | 5          |           | 10        | 30           |
| <b>TOTAL</b>                         |                                | <b>847</b> | <b>453</b> | <b>11</b> | <b>18</b> | <b>1 329</b> |



## APPENDIX 2: PUBLICATIONS AND ACTIVITIES EMANATING FROM PATHAUT DATA OR AUTOPSY SERVICE (2011)

### Journal articles

*Murray J, Davies T, Rees D.* Occupational lung disease in the South African mining industry: Research and policy implementation. *Journal of Public Health Policy* 2011; 32 S65-S79.

*Nelson G, Murray J, Phillips JI.* The risk of asbestos exposure in South African Diamond mine workers. *Ann Occup Hyg* 2011; 55(6): 569-577.

*Fligner CL, Murray J, Roberts JD.* Synergism of verbal autopsy and diagnostic pathology autopsy for improved accuracy of mortality data. *Population Health Metrics* 2011; 9:25.

*Lim MSC, Murray J, Dowdeswell RJ, Glynn JR, Sonnenberg P.* Unnatural deaths in South African Platinum Miners, 1992-2008. *PLoS ONE* 2011; 6 (9): 1-6.

*Field N, Murray J, Wong M, Dowdeswell R, Dudumayo N, Rametsi L, Martinson N, Lipman M, Glynn JR, Sonnenberg P.* Missed opportunities in tuberculosis diagnosis: Application of a TB Process-Based Performance Review tool to evaluate clinical actions and improve outcomes. *BMC Public Health.* 2011; 11:127.

### Reports

*Ndlovu N, Davies T, Milne S, Nelson G, Murray J.* Pathology Division Report: Demographic data and disease trends for January to December 2010. NIOH Report 32/2011. ISSN 1812-7681. National Institute for Occupational Health, National Health Laboratory Service, South Africa, 2011.

### Congresses

*Nelson G.* Accidental mining of asbestos: current concerns. Mine Medical Professionals' Association 13<sup>th</sup> Annual Congress, Sparkling Waters Resort, Rustenburg. 20–22 May 2011. (oral presentation)

*Nelson G, Murray J, Zhang J, Racette BA.* Research capacity development in South African manganese mines to bridge exposure and pathologic outcomes. International Conference on Neurotoxicity and neurodegeneration: local effect and global impact, Xian, China. 5–10 June 2011. (poster presentation)

*Nelson G, Murray J, Zhang J, Racette BA.* Research capacity development in South African manganese mines to bridge exposure and pathologic outcomes. International Conference on Neurotoxicity and Neurodegeneration: local effect and global impact, Xian, China. 5–10 June 2011. (oral presentation)

*Nelson G.* Asbestos exposure and diamond mining. De Beers Health and Safety Workshop 2011, De Beers House and Cornerstone, Johannesburg, South Africa. 22-23 August 2011. (oral presentation)

*Murray J.* Occupational lung cancer: to screen or not to screen? South Africa Society of Occupational Medicine (SASOM) Congress, Birchwood Hotel, Boksburg, South Africa, 27 August 2011. (oral presentation)

*Ndlovu N, Murray J, teWaterNaude J.* Clinico-pathological correlation of asbestos-related disease in ex-miners. South Africa Society of Occupational Medicine (SASOM) Congress, Birchwood Hotel, Boksburg, South Africa, 27 August 2011. (oral presentation)

*Nelson G, teWaterNaude J, Sartorius B, Chirwa T, Murray J.* Predicting mesothelioma incidence in South Africa. South Africa Society of Occupational Medicine (SASOM) Congress, Birchwood Hotel, Boksburg, South Africa, 27 August 2011. (oral presentation)

*Nelson, G.* Silicosis in platinum mine workers. South Africa Society of Occupational Medicine (SASOM) Congress, Birchwood Hotel, Boksburg, South Africa, 27 August 2011. (oral presentation)

*Phillips J, Davies JCA, Pieterse W, Murray J.* Material safety data sheets for man-made mineral fibres should include diameter distribution measurements. South Africa Society of Occupational Medicine (SASOM) Congress, Birchwood Hotel, Boksburg, South Africa, 27 August 2011. (oral presentation)

*Phillips J, Milne S, Murray J.* A database to store, organise and access information on samples sent to the National Institute for Occupational Health (NIOH) for asbestos analysis. South Africa Society of Occupational Medicine (SASOM) Congress, Birchwood Hotel, Boksburg, South Africa, 27 August 2011. (oral presentation)

*Afrika D, Ngcakaza N, Masilo P.* Is recycled formalin a good fixative? Laboratory Medicine Congress, Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. Poster presentation.

*Back P, Soko RK.* Whole lung sections for the assessment of the severity of emphysema. Laboratory Medicine Congress, Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. (poster presentation)

*Buthlezi J, Mukhovhi J, Khumalo A, Mothei P, Mditshwa D, Nelson G, Ndlovu Z.* The Intergrated Mine Workers Compensation System- a laboratory management system. Laboratory Medicine Congress, Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. (poster presentation)

*Masilo P, Afrika D, Ngcakaza N.* Experiences using a formalin recycler. Laboratory Medicine Congress, Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. (poster presentation)

*Mthombeni J, Rani G, Mbontsi P, Mashele W, Ndlovu Z.* The role of the medical technologist in autopsy compensation-a unique experience. Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. (poster presentation)

*Murray J.* Routinely collected data: A neglected resource. The inaugural Professor Hendrik Koornhof address. Laboratory Medicine Congress, Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. (oral presentation)

*Nthlane M, Garton E, Milne S, Ndlovu Z, te WaterNaude JM, Phillips JI.* Lung fibre burden of environmentally exposed individuals with mesothelioma. Laboratory Medicine Congress, Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. (poster presentation)

*Phillips JI, Davies JCA, Pieterse W, Murray J.* Material safety data sheets for man-made mineral fibres should include diameter distribution measurements. Laboratory Medicine Congress, Sandton Convention Centre, Johannesburg. 31 August- 04 September 2011. (poster presentation)

*Nathey C, Fadahun J, Bello B, Kielkowski D, Nelson G.* Trends in lung cancer mortality in South Africa 1995 -2008. 22<sup>nd</sup> International Conference on Epidemiology in Occupational Health, Oxford, UK. 7-9 September 2011. (poster presentation)

*Nathey C, Kielkowski D, Bello B, Nelson G, Fadahun J, Phillips J.* Mesothelioma rates in South Africa: trends 1995-2008. 22<sup>nd</sup> International Conference on Epidemiology in Occupational Health, Oxford, UK. 7-9 September 2011. (oral presentation)

*Nelson G, Murray J, Phillips J.* The risk of asbestos exposure in South African diamond mine workers. 22<sup>nd</sup> International Conference on Epidemiology in Occupational Health, Oxford, UK. 7-9 September 2011. (poster 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.

Nelson, Gill, PhD (ongoing), School of Public Health, University of the Witwatersrand, Occupational respiratory diseases: rates, trends and risks in platinum and diamond miners coming to autopsy from 1975 to 2010.

## Outreach Programme Activities

| ACTIVITY  | DATE           | VENUE  | PERSON   |
|---|----------------|--|--|
| Training of prosecutors in removal of cardio-respiratory organs.              | 26-28 Jan 2011 | Dr J.S. Moroka-Montsopa Hospital Complex, Thaba Nchu | Mrs J. Mthombeni<br>Mr S. Milne                |
| Planning meeting for Carletonville Silicosis, TB & HIV/AIDS campaign          | 3 March 2011   | NUM Head Office, Johannesburg                        | Mrs N Ndlovu                                   |
| Planning meeting for Silicosis, TB & HIV/AIDS campaigns                       | 10 March 2011  | NUM Head Office, Johannesburg                        | Mrs N Ndlovu<br>Mrs J Mthombeni                |
| Planning meeting for West Rand Silicosis, TB & HIV/AIDS campaign              | 23 March 2011  | Driefontein Gold Mine, Carletonville                 | Mrs J Mthombeni<br>Ms N Ngcakaza               |
| Autopsy compensation/ silicosis and TB workshop                               | 31 March 2011  | NUM, Port Elizabeth, Eastern Cape                    | Mrs N Ndlovu<br>Mrs J Mthombeni                |
| Silicosis and TB workshop (construction and quarry industries)                | 31 March 2011  | NUM, Port Elizabeth, Eastern Cape                    | Mrs N Ndlovu<br>Mrs J Mthombeni                |
| Presentation of PATHAUT - silicosis and TB findings.                          | 01 April 2011  | Chamber of Mines, Johannesburg                       | Prof J Murray<br>Mrs N Ndlovu                  |
| NUM community service: cleaning day care centre.                              | 9 April 2011   | Merafong Day Care Centre, Carletonville              | Mrs J Mthombeni<br>Ms J Buthelezi              |
| Autopsy compensation/ silicosis and TB workshop for H&S officers.             | 16 April 2011  | NUM, Carletonville                                   | Mrs J Mthombeni<br>Ms J Buthelezi              |
| Planning meeting for Silicosis, TB & HIV/AIDS campaigns                       | 06 June 2011   | NUM Head Office, Johannesburg                        | Mrs J Mthombeni                                |
| Training of prosecutors in removal of cardio-respiratory organs.              | 20 June 2011   | Martins Funerals, Pretoria                           | Mrs J Mthombeni                                |
| Visit by NUM health and safety representative                                 | 06 July 2011   | Pathology, NIOH                                      | Mrs Z Ndlovu<br>Mr D Afrika<br>Mrs J Mthombeni |
| Presented autopsy compensation to OCSA doctors.                               | 12 July 2011   | MBOD, Johannesburg                                   | Mrs J Mthombeni                                |
| Planning meeting for Matlosana Silicosis, TB & HIV/AIDS campaign              | 22 July 2011   | NUM Head Office, Johannesburg                        | Mrs Mthombeni                                  |
| Autopsy compensation/ silicosis and TB workshop for H&S officers.             | 27 July 2011   | NUM, Carletonville and Matlosana                     | Mrs J Mthombeni<br>Mr D Afrika                 |
| Training of TNT courier services drivers on formalin spills.                  | 15 August 2011 | TNT, Germiston                                       | Mr D Afrika                                    |
| Autopsy compensation/ silicosis and TB workshop for H&S officers.             | 13-14 Oct 2011 | NUM, Welkom  | Mrs J Mthombeni<br>Ms J Buthelezi              |
| Autopsy compensation/ silicosis and TB workshop for NUM National H&S officers | 17 Oct 2011    | Pathology, NIOH                                      | Mrs J Mthombeni                                |