# Annual Pathology Asbestos Analysis Report

## Bulk material and air filter data for 2022

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**NIOH Asbestos Surveillance Report 1/2023**

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Division of the National Health Laboratory Service

# TABLE OF CONTENTS



## List of figures



## List of tables

## GLOSSARY

| | |
|---|---|
| **Asbestos** | A group of fibrous silicate minerals that include chrysotile (white Asbestos; serpentine), crocidolite (blue asbestos; amphibole) and amosite (brown asbestos; amphibole) and others (actinolite, tremolite, anthophyllite; amphiboles) that were not mined in South Africa. |
| **Samples** | All materials received and analysed for asbestos. |
| **Type of sample** | The sample that was received, be it an air filter, piece of floor tile or roof grouped into either the air filter or bulk sample category. |
| **Bulk samples** | All samples that do not include air filters e.g. pieces of floor tiles, roofs, soil, ceiling, cement etc. This information was obtained from the description of the material that was sampled and submitted with the sample. |
| **Air filters** | Gold coated filters that were used in pumps to sample the air. |
| **Province** | The province where the sample was taken from. |
| **Industry** | The industry where the samples were taken was grouped into categories according the Standard Industrial Classification of all economic activities (7$^{th}$ Edition). |
| **Activity** | The activity that resulted in sending the sample to analyse for asbestos e.g. inventory purposes or identifying asbestos prior to demolition work. |

## REPORT SUMMARY

A total of 239 samples were received and analysed in 2022, a decline of approximately 25% compared to the previous year, 2021 (n=329). Of these, 106 (44.4%) contained asbestos.

The majority of the samples were received from South Africa, 174 (72.8%) and the rest of the samples were received from Botswana, 65 (27.2%). Of the samples that were received from South Africa, the majority were received from Western Cape (n=63, 36.2%) and Eastern Cape (n=62, 35.6%) followed by Northern Cape (n=23, 13.2%), Gauteng (n=16, 9.2%), and Free State (n=7, 4.0%). The least number of samples were received from the KwaZulu-Natal (n=3, 1.7%).

The majority of samples received were bulk samples (n=194, 81.2%). The most common types of bulk samples were cement (n=100, 51.5%), fibrous material (n=45, 23.2%), fascia board (n=39, 20.1%) and cotton wool (n=5, 2.6%). Upon analysis, 96 (49.5%) of the bulk samples contained asbestos. Most of these samples contained serpentine asbestos (n=50, 52.1%) followed by serpentine and amphibole mixtures (n=43, 44.8%).

The most common industries from which samples were received were construction (n=80, 33.5%) followed by electricity, gas, steam and air conditioning supply (n=54, 22.6%), and administrative and support service activities (n=52, 21.8%). All the samples in 2022 were received with complete information after engaging with the clients about the information required when submitting samples.

## BACKGROUND

In terms of the 2020 Asbestos Abatement Regulations, the first step when working with possible asbestos containing material, is to confirm whether or not the material contains this fibrous silicate. The regulations specify all precautions that need to be considered when conducting any work on any structure containing asbestos. The 2020 Asbestos Abatement Regulations have been gazetted by the Department of Labour which suggests that the identification of asbestos in materials and air will continue to remain an integral part of the regulations.

Regulations to prohibit the use, manufacture, import and export of asbestos and asbestos containing materials were promulgated in 2008. Despite this prohibition, the legacy of asbestos remains and this legacy includes environmental contamination due to activities such as mining, milling and transportation of asbestos as well as the presence of a large number of asbestos containing materials in the environment. Environmental contamination poses potential health risks to surrounding communities. These risks include the potential development of asbestos related diseases, namely, pleural plaques, asbestosis, lung cancer and malignant pleural mesothelioma. While occupational exposure through the mining, milling and manufacturing of asbestos has ceased, workers in other industries may be exposed. The incorrect removal of asbestos containing materials can result in the liberation of fibres, exposing workers in the construction and demolition industries, as well as to the community.

The National Institute for Occupational Health (NIOH) analyses samples for the presence of asbestos using scanning electron microscopy combined with electron dispersive spectrometry (SEM/EDS). This technique enables the identification of the type(s) and size of asbestos fibres present in the sample. All samples received are analysed and reported. The Electron Microscopy Unit participates in the Asbestos in Materials Schemes from Health and Safety Laboratories in the United Kingdom. This external quality assurance scheme ensures that the unit produces reliable results.

In 2003, the NIOH was able to offer a service to meet the demand by contractors to identify asbestos in materials and to enumerate asbestos fibres in air. In addition to recording the results for samples that are submitted for analysis, the NIOH also captures the information that accompanies the samples in a database. The database was created using Epi Info and contains various fields including the origin of the sample, the industry as well as the activity taking place before, at or after sample collection e.g. demolition/renovation etc. The NIOH, being a national research institute, undertakes to study various aspects of occupational and environmental health in terms of asbestos exposure. Data from these studies are also captured in the database and are included in the results presented in this report.

While the legacy of asbestos is recognised as a national problem, details of its extent and magnitude remain largely unknown. This database provides information about the location and type of asbestos that remains in the environment.

This report summarises the asbestos database. Data from the asbestos database was analysed, using STATA 16.1 version.

## SECTION 1 – SAMPLES RECEIVED AND TYPE OF ASBESTOS IDENTIFIED

The number of samples received in the period 2003 to 2022 is displayed in Figure 1.1. The total number of samples analysed in 2022 was 239. The majority (n=174, 72.8%) of the samples came from South Africa. Of these, the types of samples received were bulk (n=194, 81.2%), air filters (n=42, 17.6%) and soil samples (n=3, 1.2%). The types of bulk samples are displayed in Table 1.1.

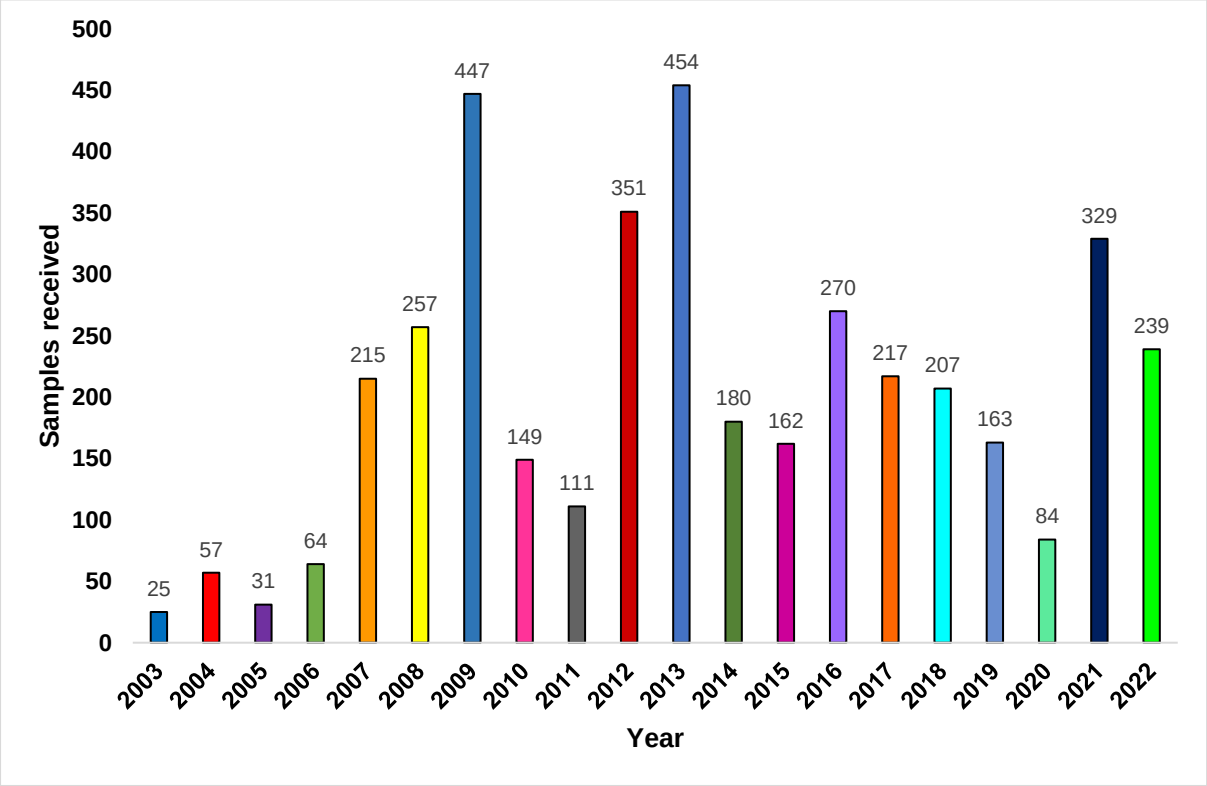


**FIGURE 1.1: TOTAL NUMBER OF SAMPLES RECEIVED (2003-2022)**

**TABLE 1.1: THE TYPES OF BULK SAMPLES RECEIVED 2022**

| Bulk type | N | % |
|---|---|---|
| Cement | 100 | 51.5 |
| Fibrous material | 45 | 23.2 |
| Fascia board | 39 | 20.1 |
| Cotton wool | 5 | 2.6 |
| *Other | 5 | 2.6 |
| **Total** | 194 | |

*Other includes polystyrene; glossy material

The number of samples that contained asbestos is displayed in Figure 1.2. Asbestos was identified in almost half of the bulk samples (n=96, 49.5%), and in ten (23.8%) of the air filter samples. Asbestos was not identified in any of the soil samples submitted. The type(s) of asbestos identified per sample type are displayed in Table 1.2.

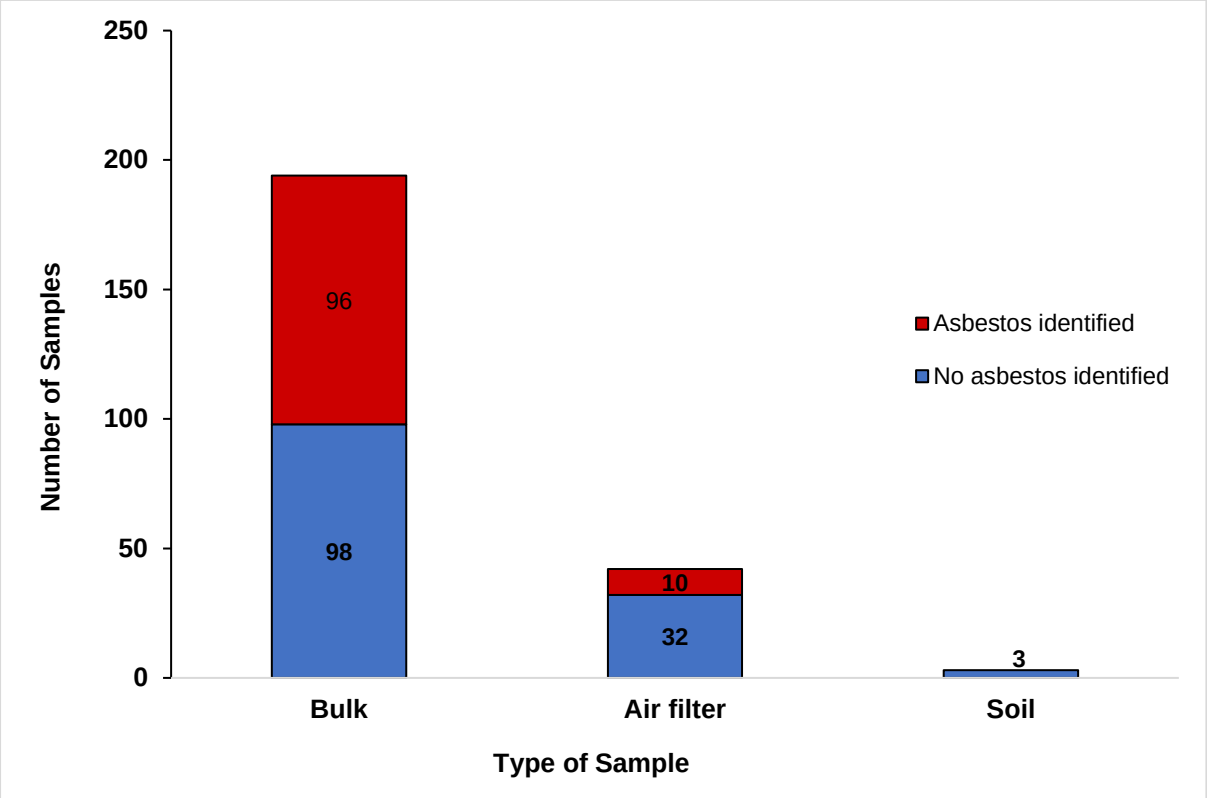


**FIGURE 1.2: THE NUMBER OF SAMPLES THAT CONTAINED ASBESTOS PER SAMPLE TYPE 2022**

**TABLE 1.2: THE TYPES OF ASBESTOS IDENTIFIED PER SAMPLE TYPE 2022**

| Asbestos type | Bulk | | Air filters | | Total |
|---|---|---|---|---|---|
| | Number | % | Number | % | Number |
| Chrysotile only | 50 | 52.1 | 4 | 40 | 54 |
| Crocidolite only | 3 | 3.2 | 4 | 40 | 7 |
| Amosite only | 0 | - | 1 | 10 | 1 |
| Chrysotile, crocidolite mixture | 39 | 40.6 | 1 | 10 | 40 |
| Chrysotile, amosite mixture | 2 | 2.1 | 0 | - | 2 |
| Chrysotile, actinolite mixture | 1 | 1.0 | 0 | - | 1 |
| Chrysotile, crocidolite, actinolite mixture | 1 | 1.0 | 0 | - | 1 |
| **Total** | 96 | | 10 | | 106 |

## SECTION 2 – SAMPLE ORIGIN

Each sample is received with accompanying information including the country or provincial origin of the sample. Information regarding the sample's country of origin (Table 2.1) was available for all samples received. The provincial origins for the samples received from South Africa in 2022 are displayed in Figure 2.1 below.

**TABLE 2.1: THE COUNTRY OF ORIGIN FOR SAMPLES RECEIVED IN 2022**

| Country of origin | Number of samples | % |
|---|---|---|
| RSA | 174 | 72.8 |
| Botswana | 65 | 27.2 |
| **Total** | 239 | |

The majority of samples were received from Western Cape (n=63, 36.2%) and Eastern Cape (n=62, 35.6%), followed by Northern Cape (n=23, 13.2%), Gauteng (n=16, 9.2%), and Free State (n=7, 4.0%). The least number of samples were received from KwaZulu-Natal (n=3, 1.7%).

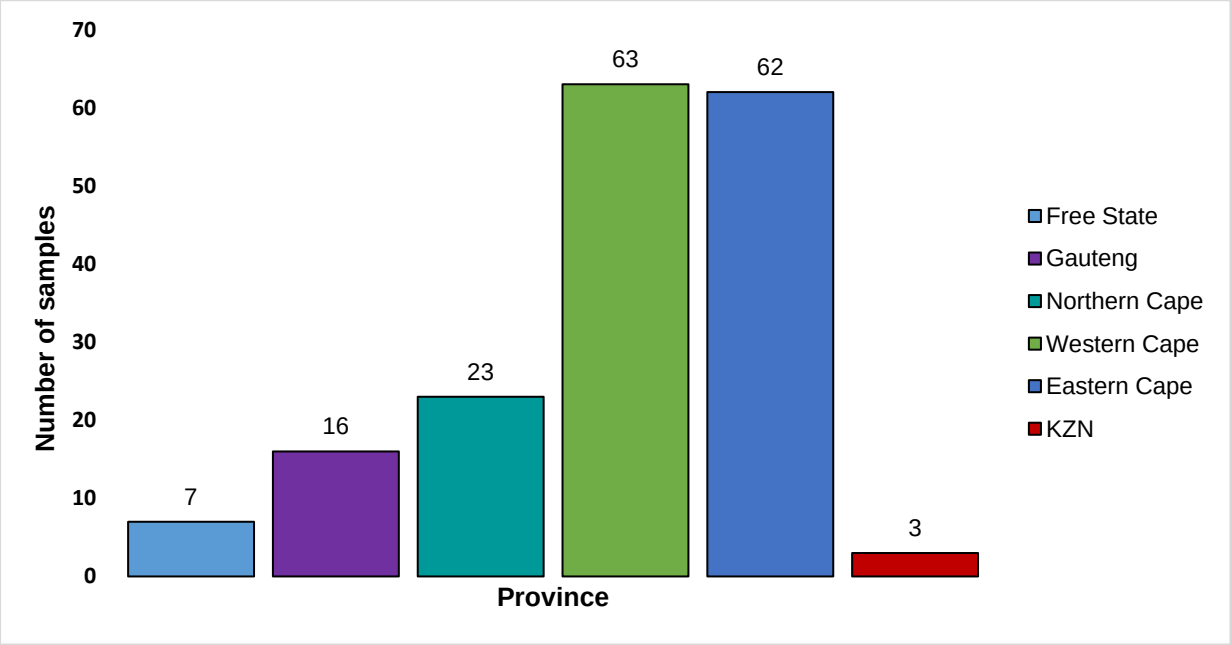


**FIGURE 2.1: THE SOUTH AFRICAN PROVINCE FROM WHICH THE SAMPLES WERE RECEIVED 2022**

## SECTION 3 – INDUSTRY CLASSIFICATION OF SAMPLES

The industrial sector was assigned to each sample according to the Standard Industrial Classification of all Economic Activities. The various industries are displayed in Table 3.1.

**TABLE 3.1: THE INDUSTRY CLASSIFICATION FOR SAMPLES RECEIVED 2022**

| Industry classification | N | % |
|---|---|---|
| Administrative and support service activities | 52 | 21.8 |
| Construction | 80 | 33.5 |
| Electricity, gas, steam and air conditioning supply | 54 | 22.6 |
| Human health and social work activities | 2 | 0.8 |
| Mining and quarrying | 32 | 13.4 |
| Professional, scientific and technical activities | 19 | 7.9 |
| **Total** | 239 | |

The percentage of samples that contained asbestos per industry classification is displayed in Figure 3.1. No sample from the electricity, gas, steam and air conditioning supply (EGSAS) (n=54) and human health and social work activities (HHSWAs) (n=2) industries contained asbestos. Majority of the samples received from the administrative and support service activities (ASSAs) (n=41, 78.8%) contained asbestos, followed by construction (n=48, 60%), professional, scientific and technical activities industries (PSTAIs) (n=10, 52.6%) and mining and quarry (MQ) 21.9% (n=7).

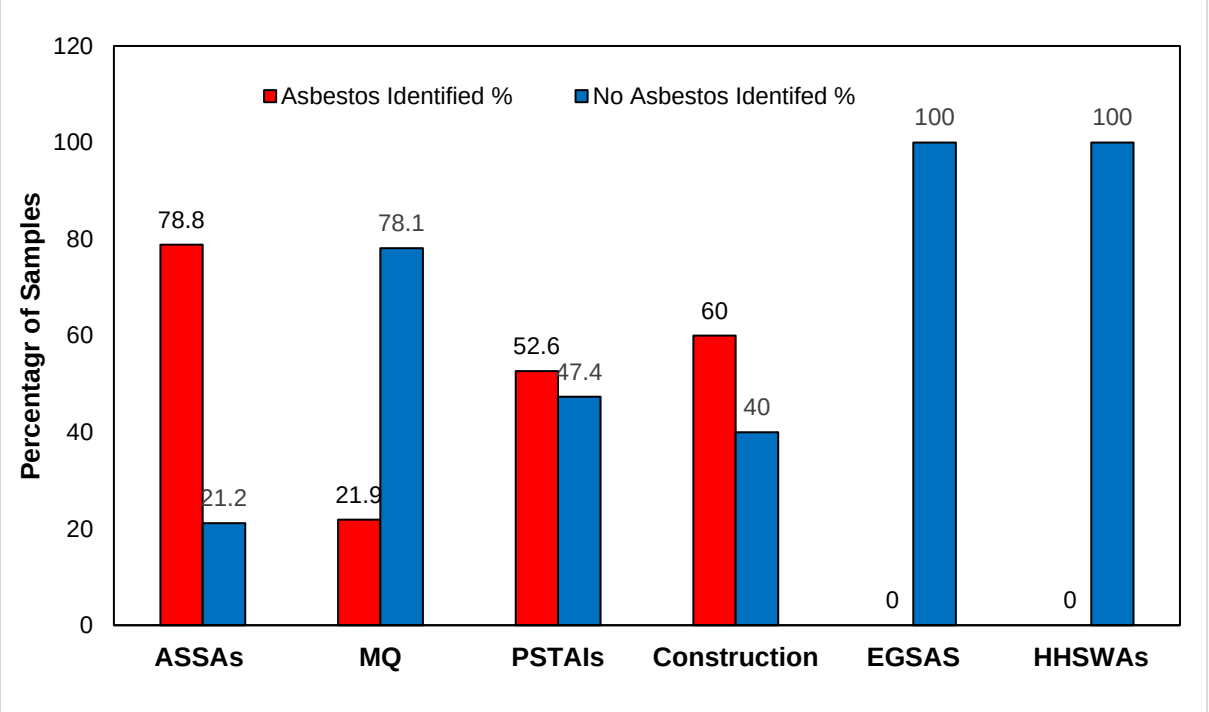


**FIGURE 3.1: THE PERCENTAGE OF ASBESTOS CONTAINING SAMPLES BASED ON INDUSTRY CLASSIFICATION FOR SAMPLES RECEIVED 2022**

[#]The percentage of asbestos containing materials is based on the samples that were received and analysed in the NIOH Pathology department in 2022.

## SECTION 4 – ACTIVITIES BEFORE, AT OR AFTER SAMPLE COLLECTION

The activities taking place before, at or after sample collection were categorised and displayed in Table 4.1. The majority of the air filter samples were sent for mining (n=19, 45.2%) and inventory activities (n=16, 38.1%) purposes. Seven (16.7%) of air filter samples were sent for air monitoring purposes. Most of the bulk samples were sent for inventory purposes (n=187, 96.4%).

**TABLE 4.1: ACTIVITIES BEFORE, AT OR AFTER SAMPLE COLLECTION 2022**

| Activity | Sample type | | | | | |
|---|---|---|---|---|---|---|
| | Air filters | % | Bulk | % | Soil | % |
| *Air monitoring | 7 | 16.7 | 0 | - | 0 | - |
| Mining | 19 | 45.2 | 0 | - | 0 | - |
| Inventory | 16 | 38.1 | 187 | 96.4 | 3 | 100 |
| Renovation | 0 | - | 7 | 3.6 | 0 | - |
| **Total** | 42 | | 194 | | 3 | |

*Air monitoring includes, but is not limited to, the monitoring of asbestos landfill/waste sites, communities and clean ups.

The percentage of samples based on the activities taking place before, at or after sample collection that contained asbestos were categorised and displayed in Figure 4.1. The activity that had the highest percentage of asbestos containing samples was inventory (n=99, 47.8%), followed by air monitoring (n=2, 28.6%), mining (n=4, 21.1%) and renovation (n=1, 16.7%).

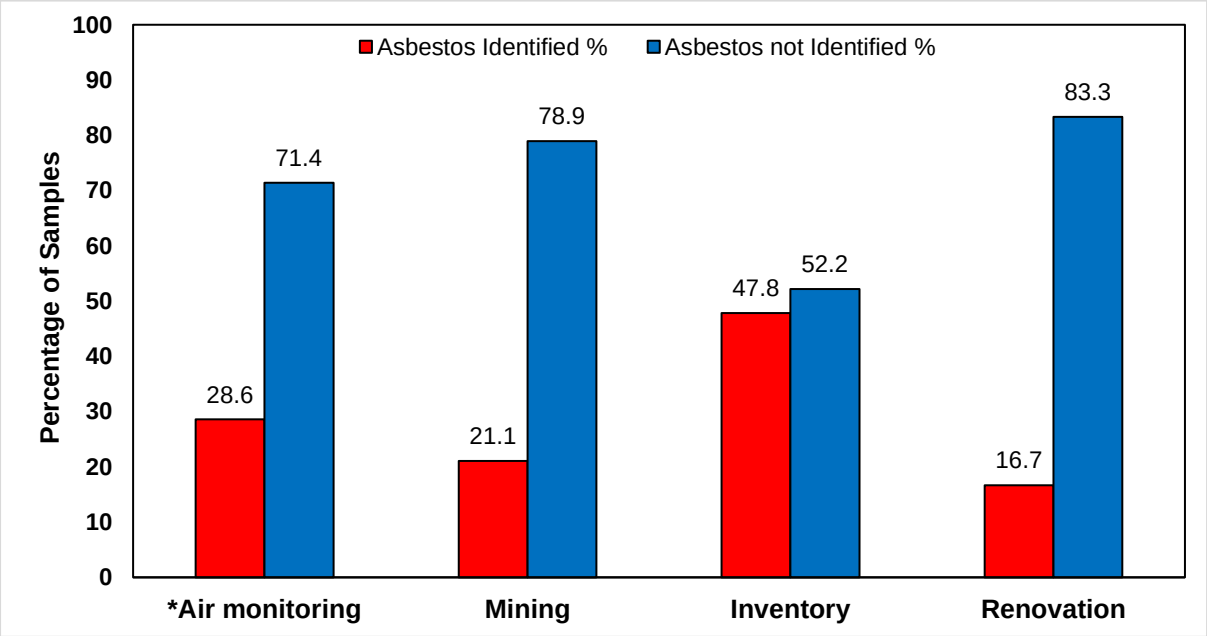


**FIGURE 4.1: THE PERCENTAGE OF ASBESTOS CONTAINING SAMPLES PER ACTIVITIES BEFORE, AT OR AFTER SAMPLE COLLECTION 2022**

#The percentage of asbestos containing materials is based on the samples that were received and analysed in the NIOH Pathology department in 2022.

## ACKNOWLEDGEMENTS

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## APPENDIX 1: PUBLICATIONS, PRESENTATIONS AND POSTERS UTILISING THE ASBESTOS DATABASE

**Publications:**

Vorster T, Kgokong N, Phillips JI. Exploring the South African legacy of asbestos using routinely collected data. *Occupational Health Southern Africa,* 2018 pp 5-9.

Rees D, Phillips JI. The legacy of in situ asbestos cement roofs in South Africa, *Occupational and Environmental Medicine*, 2017;74 (Suppl 1): A76-A77.

Phillips JI, Norman G, and Renton K. Asbestos in soil around dwellings in Soweto. *Occupational Health Southern Africa*, 2009;15(2):24–27.

Phillips JI, Rent K, Murray J, Garton E, Tylee BE, and Rees D. Asbestos in and around Soweto dwellings with asbestos cement roofs. *Occupational Health Southern Africa*, 2007;13(6):3–7.

Milne SJ, Garton E, Nelson G, Murray J, Davies JCA, Phillips JI. A South African database of samples analysed for the presence of asbestos. *Occupational Health Southern Africa*, 2003;19(6):14–21.

**Oral presentations:**

Kgokong N, McCabe M, Mhlongo LN. The NIOH asbestos database (an update). Asbestos Land and Remediation workshop; 12 March 2020. Sierra Burgers Hotel, Pretoria

Rees D, Phillips JI. *In situ* asbestos and the risk of exposure for workers. An International challenge. EPICOH conference; 28 – 31 August 2017. Edinburgh Scotland

Kgokong N, Vorster T, Kereeditse KR, Phillips JI. The NIOH asbestos database – What can it tell us? World day for Safety and Health at Work; 30 May 2017. NIOH Braamfontein

Vorster T, Kgokong N, Kereeditse KR, Phillips JI. The NIOH asbestos database – What can it tell us? Research Forum; 19 April 2017. NIOH Braamfontein

**Poster presentations:**

Ngcobo Z, Mhlongo L, Keyter M, de Bruin J, Lakhoo D. How far are we in ending the legacy of asbestos: an overview from the 2021 surveillance report? Poster presentation at NIOH Biannual Research Day, 30 November 2022, Johannesburg, S.A

Vorster T, Kgokong N, Phillips JI. The possible health implications of the legacy of asbestos cement roofs in South Africa. Pathology Research and Development Congress; 23-24 June 2017. Emperor's Palace, Johannesburg, South Africa