



REPORT

**Case Finding Study - Respirable crystalline silica
exposure in the NSW manufactured stone industry**
Data triangulation of NSW Government Agency information

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Authorship and Acknowledgements

This case finding study has been conducted using data and information provided by SafeWork NSW, icare NSW, and NSW Health, and sourced from publicly available literature. The authors, Matthew James BSc, MEM (Principal Environmental Scientist, Golder Associates) and Rachael Martin PhD (Senior Environmental Scientist, Zoic Environmental), have compiled this report independently of the government agencies. Assistance from SafeWork NSW and icare NSW was given in the form of providing further details and context to the lines of enquiry and following our initial interrogation of the data.

Contributions and review from Sarah McKiernan (Principal Toxicologist, Golder Associates) and Mike Woods (Principal Health and Safety Consultant, Golder Associates) were provided at key drafting points of this report.

This case finding study has been externally peer reviewed by Barry Chesson, PhD. Dr Chesson's letter of endorsement is provided in Appendix A.

Executive Summary

SafeWork NSW commissioned this case finding study to investigate respirable crystalline silica exposure in the manufactured stone industry, and to gather information to improve the identification and assessment of workers at risk of exposure. This case finding study is a requirement of Section 276A of the Work Health and Safety Amendment (Information Exchange) Act 2020 No 34 which came into force in 2020.

This case finding study reports on new cases of silicosis reported in the manufactured stone industry in NSW during financial years 2017-18, 2018-19 and 2019-20 (the reporting period). In instances where additional data has been provided outside of the reporting period, these data have been presented and discussed in the context of the case finding study aims.

In the five years preceding the reporting period, the number of NSW workers among all industries/occupations certified with silicosis by icare NSW ranged between 6 and 9 cases per financial year. This generally corresponds to the rate of NSW Health first time hospital admissions of working aged people (adjusted). During the reporting period, a total of 3030 workers across all industries in NSW were screened for silica exposure by icare NSW, including 696 (23%) manufactured stone industry workers. Among these 696 manufactured stone industry workers, 88 (12.6%) were certified with silicosis by icare NSW. This is an average of 29 cases per year from just the manufactured stone industry, over three times the number of cases reported for all industries prior to the identification of cases from the manufactured stone industry (8.7 cases per year).

Of the 88 manufactured stone workers certified with silicosis, 63 (72%) had chronic simple silicosis and 25 (28%) were diagnosed with one of the more severe form of the disease such as chronic complicated, acute silicosis or accelerated silicosis. The emergence of these more severe forms of silicosis are likely associated with high levels of exposure to crystalline silica and also are likely to be linked to the manufactured stone industry. A high proportion of workers (77%) with a silicosis diagnosis were assigned a disability level (i.e. level of lung function loss) of 1% suggesting that these workers had no or minimal silicosis symptoms at the time of certification. Some of these 1% cases may be due to high levels of exposure and may progress rapidly to higher levels of disability. The remaining 23% of manufactured stone industry workers were assigned a disability level ranging between 5% and 40%.

The majority of manufactured stone industry workers certified with silicosis by icare NSW were stonemasons (70%), followed by manufactured stone installers (15%). Machine operators (7%) and workplace managers (7%) were also among occupations identified among manufactured stone workers certified with silicosis.

Based on the average number of workers estimated by SafeWork NSW at each manufactured stone fabrication facility, there is estimated to be approximately 1454 manufactured stone industry workers in NSW. Based on this number of workers, the average incidence of silicosis among the manufactured stone industry is estimated to be 6%. However, based on the uncertainties regarding the actual number of manufactured stone workers in NSW, silicosis incidence could be as low as 4% (based on the maximum estimated number of workers) or as high as 9% (based on the minimum estimated number of workers).

With regard to data provided by NSW Health (hospital admissions and deaths data), it is not possible to draw any conclusions regarding manufactured stone workers as the occupations of patients have not been reported. This has since been corrected since 1 July 2020 and the annual reporting going forwards. On a population level, data provided by NSW Health indicate that although NSW hospital admissions due to silicosis have fluctuated over the last 15 years, first time hospitalisations during 2017-18 were twice that of the previous financial year. Although the numbers were too small for robust statistical evaluation, first time hospital admissions data suggest that there has been an increase in the number of younger patients (22 less than 50 years old people) admitted

to hospital due to silicosis in the last five years (12) compared to the previous two five-year periods (3 and 7). Interrogation of the cases in working-aged cases shows an increase in silicosis cases (industry non-specific) since 2012. The number of deaths attributed to silicosis, as provided in NSW Health data, is highly variable and does not suggest any clear trends in mortality due to this disease.

SafeWork NSW has identified that prior to their campaign, the manufactured stone industry was not meeting its duty to provide health monitoring for workers. Health monitoring data by a Person Conducting a Business or Undertaking (PCBU) is improving as SafeWork NSW's campaign continues. This reporting complements the notification of silicosis diagnosis by physicians to NSW Health. However, as PCBUs are reporting on current working-age cases in the current cohort of manufactured stone industry workers, it is important that the health monitoring case notification is provided in a timely manner to ensure cases are identified early. Additionally, it is imperative that the application of the hierarchy of controls principle in the manufactured workplace setting remains the priority and is only complemented by health screening.

Timeline of Key Events

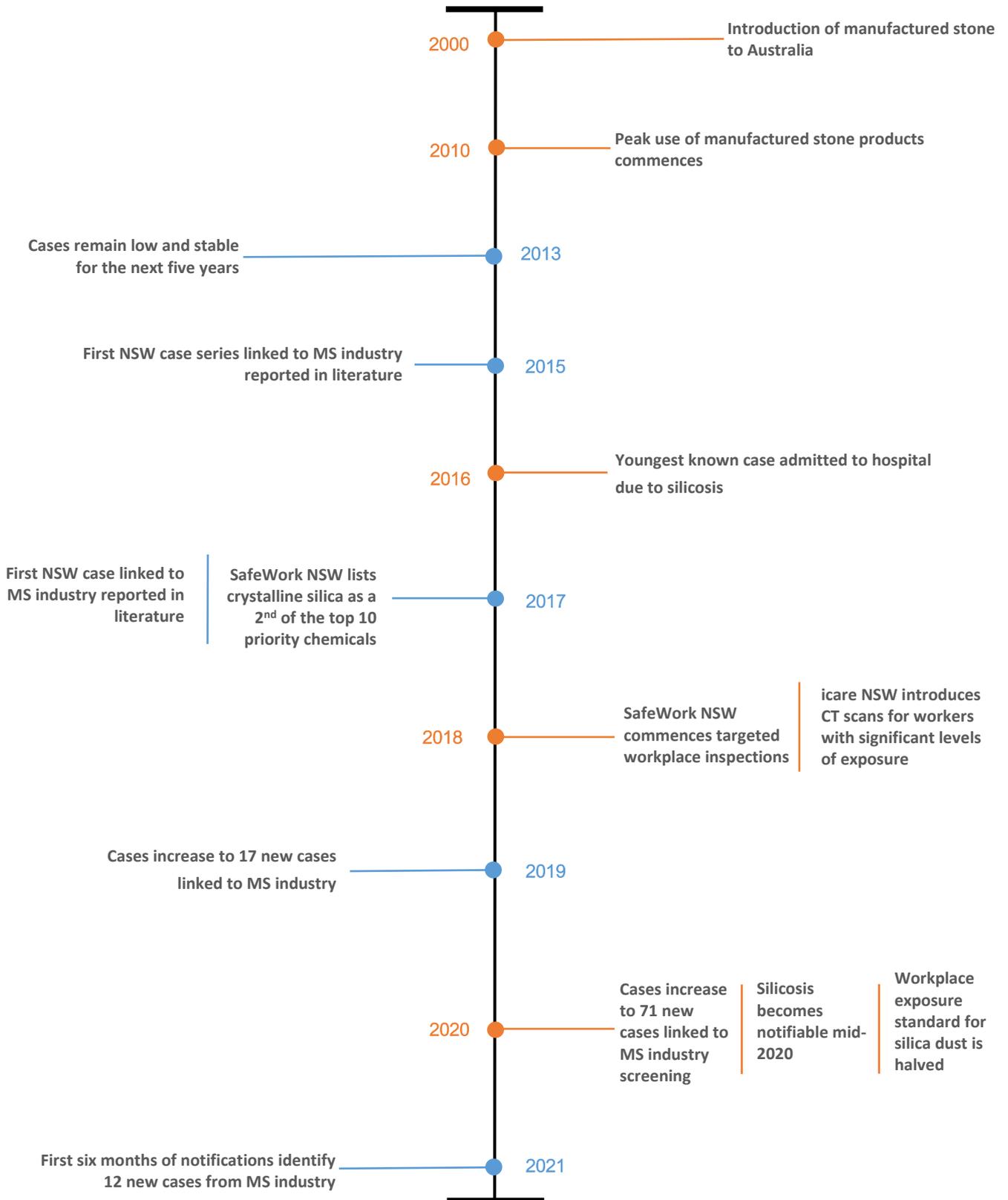


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Important Information about this Report

1.0 ABOUT THIS REPORT

SafeWork NSW has requested this report be independently prepared and peer reviewed to meet Section 276A of the Work Health and Safety Amendment (Information Exchange) Act 2020 No 34 which came into force in 2020. The Section 276A amendment requires SafeWork NSW to conduct a case-finding study to meet the following overarching aims:

- To investigate respirable crystalline silica exposure in the manufactured stone industry, and
- To gather information to improve the identification and assessment of workers at risk of exposure.

In addition to the overarching aims, the objectives of this case finding study were to address the following key questions:

- i) What is the incidence and prevalence of silicosis from exposure to respirable crystalline silica in manufactured stone workers?
- ii) Is the available data representative of manufactured stone workers in NSW?
- iii) Is the data comparable to other jurisdictions in Australia and internationally?
- iv) Is additional data able to be collected to benefit of informing key question i)?

To address these aims and objectives, this case-finding study describes cases of silicosis in NSW for three consecutive financial years, from 1 July 2017 to 30 June 2020 (the reporting period), and provides the following details:

- An estimate of the number of manufactured stone workers employed in the manufactured stone industry.
- Geographical locations of the manufactured stone fabrication facilities.
- The number of new silicosis cases among manufactured stone industry workers, as reported by icare NSW.
- A description of the form and severity of silicosis at the time of first diagnosis, as reported by icare NSW.
- Information regarding the occupations of manufactured stone workers diagnosed with silicosis, as reported by icare NSW.
- Estimates of the incidence of silicosis among workers within the manufactured stone industry in NSW, based on icare NSW data.
- The number of new silicosis cases among manufactured stone workers, as reported to SafeWork NSW through provision of Health Monitoring reports.
- The number of hospital admissions and deaths due to silicosis among NSW residents, as reported by NSW Health.
- Basic demographics of NSW residents diagnosed with silicosis, as reported by NSW Health.

In instances where additional data has been provided (or obtained by the report authors) outside of the reporting period, these data have been presented and discussed in the context of the case finding study aims and objectives.

No personal information identifying workers has been made available to the authors of this report and hence is not included in this report.

2.0 THE PROBLEM WITH RESPIRABLE CRYSTALLINE SILICA AND MANUFACTURED STONE

Silicon dioxide (silica) is the most abundant mineral on Earth and occurs naturally in almost all types of rock, sand, clay, and gravel. The most common crystalline forms of silica (also known as free silica) include quartz, cristobalite, and tridymite, with quartz being the most abundant form.

Crystalline silica is found in a variety of construction products such as sand, stone (particularly sandstone), concrete, and mortar and is used to manufacture building products such as manufactured stone, bricks, and tiles. Natural stone materials such as marble and granite, as well as concrete contain between 2-40% crystalline silica. Manufactured stone products, such as stone kitchen and bathroom benchtops are produced from crushed stone and/or sand and can contain up to 95% crystalline silica.

Crystalline silica is an aggressive, lung-damaging dust. The toxic effects of silica occur when dust particles are small enough to penetrate and deposit deep within the distal airways and alveoli. For dust to enter the lower extremities of the lungs in sufficient quantity to cause lung damage, the particles must be less than 10 µm equivalent in diameter; these particles are considered 'respirable' (AIOH, 2018). Exposure to this form of silica dust, also known as 'respirable' crystalline silica, is linked with occupational diseases and lung conditions (AIOH, 2009). Further information regarding the measurement of respirable crystalline silica can be found in AIOH (2018).

Respirable crystalline silica is generated when workers cut, crush, drill, polish, saw, or grind crystalline stone products, or during projects involving the handling of crystalline silica products. The risk of high-level exposure to crystalline silica from manufactured stone may occur during all stages, during fabrication (stone cutting, shaping, and finishing), assembly and installation. Such high-level exposure risks occur due to the use of high-energy, powerful cutting and polishing devices which can generate large quantities of respirable crystalline silica (Leso, et al., 2019). The risk of crystalline silica exposure is exacerbated when dry cutting and polishing techniques are performed by manufactured stone workers (Hoy, et al., 2018). Uncontrolled dry cutting of manufactured stone is prohibited in NSW under existing WHS legislation, however since July 2020 has been subject to a specific on-the-spot fine (SafeWork NSW, 2020).

When respirable crystalline silica particles are deposited in the lung tissue, the resultant inflammation and scarring can lead to a decrease in lung capacity which can eventually lead to chronic breathing problems and diseases of the lung; the most common being silicosis. There is also compelling evidence that silicosis constitutes a major risk for lung cancer (AIOH, 2009; AIOH, 2018). For this reason, the International Agency for Research on Cancer (IARC) concluded that there is sufficient evidence in humans for the carcinogenicity of respirable crystalline silica in the form of quartz and cristobalite in occupational settings (IARC, 1997). Silicosis, and some other silica-related diseases, are discussed in Section 3.

Cumulative respiratory exposure dose is the primary factor associated with the development of silicosis (Hoy & Chambers, 2020). While those who work in construction, tunnelling, and the mining industry may be at risk of exposure to silica dust, those working with manufactured stone products are considered to face the greatest risk, based on the comparatively higher content of silica in manufactured stone products.

While silica content is one consideration for evaluating the risk of manufactured stone, the application of suitable controls to limit the generation of dust into the breathing zone of workers is of great importance. Moreover, it is the measurement of personal exposure (dose) that enables comparisons to be made against exposure standards, and an assessment carried out. To control the risk of silicosis in the workplace, the hierarchy of control provides a systematic approach for the elimination or reduction of risk (Figure 1). It provides six levels of control measures, with the most effective measure at the top (e.g., elimination of silica dust from the workplace) of the hierarchy, and the least effective at the bottom (e.g. personal protective equipment, such as a respirator).

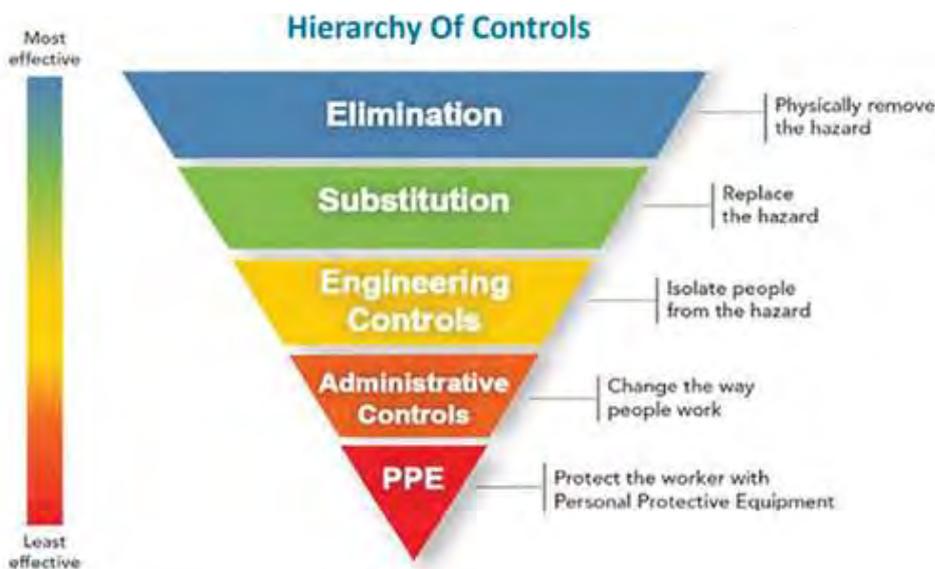


Figure 1: Hierarchy of controls diagram (source: AIOH 2019)

The manufactured stone industry is prominently made up of qualified stonemasons (tradespeople) and untrained labourers. Like all workforces in NSW there is a mixture of workers from across many communities and ethnicities. Anecdotally, culturally, and linguistically diverse (CALD) workers form a high percentage of the labour workforce. Small or lone kitchen / bathroom installers are known to sub-contract stonemasons and labour (skilled and unskilled) as their workload and opportunity requires. Across all manufactured stone industry workplaces, big or small, there is no formal training, limited oversight of activities, no knowledge of regulatory requirements, limited resources to meet regulatory requirements, no understanding of crystalline silica exposure risk, or no responsibility taken to ensure worker health and safety, there will be a low level of engagement in work, health and safety issues. The nature and scale of the manufactured stone industry is thus very difficult for all government agencies to regulate, inform and protect.

Work, Health and Safety regulators and peak bodies across Australia have developed a substantial amount of guidance and educational material over the last few years to attempt to inform and protect those at risk of exposure to respirable crystalline silica across Australia. Some of these guidance materials include:

- Safe Work Australia (2019). Working with silica and silica containing products. National guidance material.¹
- SafeWork NSW, Crystalline silica – technical fact sheet.²
- SafeWork NSW, Silica safety videos, English, Mandarin, Arabic & Vietnamese.³
- The NSW Work Health and Safety Roadmap for NSW 2022.⁴
- Workplace Health and Safety Queensland (2019). Code of Practice: Managing respirable crystalline silica dust exposure in the stone benchtop industry. Office of Industrial Relations, Queensland.⁵
- WorkCover WA: Fact sheet for workers: Silicosis claims in the engineered stone benchtop industry⁶
- AIOH Breath Freely Australia Website – Breath Freely with Engineered Stone⁷

¹ [Guidance material or code of practice template \(safeworkaustralia.gov.au\)](https://www.safeworkaustralia.gov.au)

² [Crystalline silica - technical fact sheet | SafeWork NSW](#)

³ <https://www.safework.nsw.gov.au/hazards-a-z/hazardous-chemical/priority-chemicals/crystalline-silica>

⁴ [Work health and safety roadmap for NSW 2022](#)

⁵ [Managing respirable crystalline silica dust exposure in the stone benchtop industry Code of Practice 2019 \(worksafe.qld.gov.au\)](#)

⁶ [Fact Sheet for Workers – Silicosis claims in the engineered stone benchtop industry - WorkCover WA](#)

⁷ <https://www.breathefreelyaustralia.org.au/stone/>

3.0 SILICOSIS AND OTHER SILICA-RELATED DISEASES

Silicosis is a progressive, irreversible, and incurable occupational disease caused by inhalation exposure to respirable crystalline silica dust. Impairment of lung function and the severity of symptoms increase with disease progression, even after the cessation of respirable crystalline silica exposure (Leung, et al., 2012). In the lung, silicosis appears as discrete hard nodules (essentially scar tissue) that form as result of the inflammation response to the presence of silica dust particles (Leung, et al., 2012).

There are three main forms of silicosis (chronic, accelerated, and acute), with each form dependent upon the exposure duration and intensity; as well as clinical, radiological, and pathological features (Table 1).

The progression of the chronic form can be further categorised into two types based on the size of the nodules in the lung: chronic simple (nodular) silicosis is characterised by nodules that are less than 10 mm, while chronic complicated silicosis (also known as progressive massive fibrosis) is characterised by nodules greater than 10 mm.

As the disease progresses, those with chronic simple silicosis can transition to the complicated type, with symptoms such as cough, sputum production, and breathlessness likely to be more severe in those with larger nodules (Hoy & Chambers, 2020).

The chronic and accelerated silicosis forms differ in their latencies however are most likely a result of the same disease mechanism. Acute silicosis, on the other hand, is a rapidly progressing disease which differs in pathology to the chronic form and may therefore develop from a different disease mechanism (Wagner, 1996).

Table 1: Forms of silicosis (summarised in Hoy & Chambers, 2020).

Silicosis type	Respirable crystalline silica exposure	Latency	Details
Chronic simple (nodular) silicosis	Low level	>10 y (up to 30 y)	Pulmonary nodules up to 10 mm diameter. Usually, asymptomatic.
Chronic complicated silicosis (progressive massive fibrosis)	Low level	> 10 y (up to 30 y)	Pulmonary nodules and masses greater than 10 mm diameter. Symptoms and progression are associated with radiological severity.
Accelerated silicosis	Moderate-high level	< 10 y	Disease progression is more rapid than the chronic form. Disease features may be a combination of the chronic and acute forms.
Acute silicosis	Very high level	Within weeks to 5 y	Similar features to alveolar proteinosis. High mortality.

Other health impacts associated with silica exposure include other respiratory and non-respiratory conditions such as sarcoidosis, autoimmune disease (e.g., rheumatoid arthritis), lung cancer, and pulmonary infections (Hoy & Chambers, 2020). Occupational exposure to respirable crystalline silica also renders the worker susceptible to developing pulmonary tuberculosis (AIOH, 2009; AIOH, 2018).

4.0 BACKGROUND TO THE RECENT RISE OF SILICOSIS AND INCREASED AWARENESS OF RESPIRABLE CRYSTALLINE SILICA

In many high-income countries, the incidence of silicosis has progressively decreased over the last decades, mainly due to the introduction of effective preventative measures in the workplace, in combination with the implementation of occupational health surveillance programs (Leon-Jimenez, et al., 2020).

The first known case of silicosis linked to respirable crystalline silica dust exposure in the Australian manufactured stone industry was reported in the literature in 2015 (Frankel, et al., 2015). Since this time, there has been a series of silicosis cases among relatively young, manufactured stone workers, reported in the Australian media. There has also been growing concern within the medical profession regarding the health and safety of manufactured stone workers, stonemasons, and other silica workers, in NSW (Matar, et al., 2017; Kirby, 2019; Hoy, et al., 2018).

The first case series describing silicosis associated with exposure to manufactured stone product dust was reported in academic literature in 2017 (Thiruvardchelvan, et al., 2017). The case series was described by NSW Health respiratory physicians as a cluster of four cases in South Western Sydney (Thiruvardchelvan, et al., 2017). The four cases were all male over the age of 50 and presented to the respiratory clinic in financial year 2016-2017. Two patients had preserved lung function, two patients had respiratory failure, and one of the patients was awaiting a lung transplant.

The death of a 45-year-old manufactured stone worker due to silicosis has also been recently reported by NSW physicians (Turner, et al., 2020).

Despite the reports of silicosis among manufactured stone workers in NSW, the incidence of silicosis appeared to be relatively low among the NSW workforce, as indicated in the icare NSW annual reports (icare NSW, 2017; icare NSW, 2018; icare NSW, 2020).

During the time that silicosis cases were being observed in NSW and other Australian states, SafeWork NSW had listed crystalline silica as a top 10 priority chemical in its 2017-2022 Hazardous Chemicals and Materials Exposures Baseline and Reduction Strategy, October 2017 (SafeWork NSW, 2017). The inclusion of silica in the five-year strategy was based on a series of pilot workplace visits and industry stakeholder engagement activities as part of a research project to identify chemicals and materials causing the most harm to workers.

Based on the research project findings, silica was prioritised as one of the top two priority chemicals for initial workplace intervention programs through the following initiatives:

- Awareness (educational materials)
- Interactions (liaising with industry)
- Research (health monitoring, medical testing, international modelling)
- Legislation (review of workplace exposure standards, guidance and/or codes of practice).

In support of SafeWork NSW's research component of the Strategy, icare NSW agreed to provide free and subsidised health monitoring for silica dust exposure among NSW workers for the duration of the strategy implementation (2017-2022).

The increased awareness of the identified potential risks of respirable crystalline silica in the manufactured stone industry subsequently led SafeWork NSW to fast-track key elements of its five-year Strategy, with respect to silica.

5.0 REVIEWS INTO THE DUST DISEASE SCHEMES (2018 AND 2019)

The NSW and Commonwealth Governments have responded to the increase of silicosis cases through a series of reviews, via the establishment of taskforces, and other key activities. The timeline for these key activities are provided in the Timeline of Key Events on page iv.

5.1 NSW Legislative Reviews

The recent rise of silicosis in Australia has prompted efforts by the NSW Government to ensure that workers are protected from exposure to respirable crystalline silica. These efforts have been driven by SafeWork NSW's commitment to protecting workers. SafeWork NSW has responded to the recommendations handed down by the Parliament of NSW Legislative Council's Standing Committee on Law and Justice (Legislative Council (2017), (2019), (2020)) following the 2017, 2018 and 2019 reviews into the Dust Diseases Scheme.

The recommendations relevant to this case-finding study are:

- In the 2017 Review, five recommendations were made including Recommendation 1: *'That the relevant Minister urgently convene a taskforce of industry, regulatory and workforce representatives to review safety standards in the manufactured stone industry and consider regulatory changes necessary to protect workers in the industry.'* The taskforce identified in their Final Report (SafeWork NSW, July 2019) Problem Statement 1 that *'there was no clear picture of the number of silicosis cases in the community.'*
- In the 2018 Review, eight recommendations were made including Recommendation 1: *'That icare and SafeWork NSW conduct a case finding study for silicosis in the manufactured stone industry in NSW.'*
- In the 2019 Review, 14 recommendations were made including Recommendation 11: *'That NSW Health, in conjunction with SafeWork NSW, co-ordinate a case finding study for respirable crystalline silica exposure in the manufactured stone industry, to improve the identification and assessment of workers at risk of exposure.'*

The NSW Government response to Recommendation 11, as tabled in parliament on 24 September 2020, indicated full support of the active finding of silicosis cases among people working in industries where they are exposed to silica dust. The response indicated that NSW Health, SafeWork NSW, and icare NSW were working in partnership to actively identify new cases through implementation of the following initiatives:

- icare NSW lung screening health monitoring service. (icare NSW has been providing this service for workers engaged in silica work from all industries for decades).
- SafeWork NSW Work Health and Safety Roadmap for NSW 2022.
- NSW Health analysis of hospital admissions and deaths attributed to silicosis.

Legislative change initiatives requiring the notification of silicosis cases, as well as ongoing health screening and monitoring of workers in the manufactured stone industry have been implemented with effect from 1 July 2020. Given that these changes came into place after the case finding study reporting period, they have been described in more detail towards the end of the report, in Section 8.0.

5.2 National Review

The National Dust Disease Taskforce (NDDT) was established by the Federal Government in July 2019. The NDDT is developing a national approach for the prevention, early identification, control, and management of occupational dust diseases in Australia. The NDDT has made interim recommendations⁸ that a national

⁸ <https://www1.health.gov.au/internet/main/publishing.nsf/Content/ohp-nat-dust-disease-taskforce.htm>

approach be taken to understand the extent of occupational dust disease in Australia, across and within each jurisdiction. In particular, the NDDT recommended exploring data linkage and information sharing to enable more sophisticated reporting on the incidence and trends in occupational disease to potentially inform more timely and appropriate interventions and prevention actions.

The interim report of the NDDT was released in December 2019, and the final report is due to be presented to the Commonwealth Minister for Health by 30 June 2021.

6.0 SOURCES OF SILICOSIS CASE FINDING DATA

This section describes the framework in which data is collected by icare NSW, SafeWork NSW, and NSW Health in relation to new cases of silicosis in NSW.

6.1 Health Screening and Compensation – icare NSW

There are two avenues in which a diagnosis of silicosis may be recorded by icare NSW:

- Workers can arrange for a medical assessment if they suspect they have been exposed to respirable crystalline silica or have received a silicosis diagnosis and are seeking compensation. In this instance, the worker applies for workers compensation directly to icare NSW.
- Employers must provide regular health monitoring to workers exposed to silica dust that poses a significant risk to their health. icare NSW provides subsidised health monitoring for workplaces across NSW through its lung screen service. This is also referred to as ‘*workplace screening*’.

The purpose of the medical assessment (for both direct applications and workplace screening) is to identify any abnormalities in lung function. Screening checks may include lung X-ray, CT scan, lung function test, and medical consultation. In line with best practice recommendations, icare NSW recently introduced a policy of routinely recommending a CT scan for workers with a significant level of exposure to respirable crystalline silica, as this is a more sensitive method for identifying early changes in the lung, compared to lung X-ray.

Workers who have contracted silicosis (or another scheduled dust disease under legislation) in a NSW workplace have a right to claim for monetary compensation for their loss of lung function due to their disease, through a no-fault workers compensation scheme following occupational exposure in NSW⁹. The icare NSW Medical Assessment Panel certifies if an applicant for compensation has contracted silicosis in NSW.

When the Medical Assessment Panel certifies that a worker has silicosis, a disability level is assigned to the worker at the time of certification. The level of disability is directly related to the degree of lung function loss at the time of certification. Also recorded by the Medical Assessment Panel at the time of certification is the type of silicosis that the worker has contracted.

Data presented in a report compiled by icare NSW entitled ‘*Silicosis report based on industry collected via health monitoring screenings and occupation from industrial history team*’ were used for the purposes of this case finding study. The information provided in this report was collected from direct applications to icare NSW and workplace screening (health monitoring) activities.

The limitations associated with icare NSW data are discussed in Section 12.0.

6.2 Public Health Surveillance – NSW Health

Data pertaining to silicosis, as recorded by NSW Health, may be identified through the following sources:

- Hospital admissions due to silicosis via the Admitted Patient, Emergency Department Attendance and Deaths Register, NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence. This data may also include admissions to rehabilitation units and emergency department-only admissions.
- Deaths due to silicosis via the Cause of Death Unit Record File (COD URF) held by the Ministry of Health Secure Analytics for Population Health Research and Intelligence.

⁹ icare NSW does not cover dust diseases contracted by coal miners in or around coal mining. These entitlements are administered by the Coal Services Workers Compensation Insurance.

Prior to the legislative changes implemented on 1 July 2020, there was no legislation that compelled NSW Health to conduct population health surveillance for silicosis, to report on cases of silicosis, or to provide notifications of silicosis to SafeWork NSW.

Data presented in a report by NSW Health entitled “*Hospital admissions and deaths from silicosis in NSW*” (dated 1 October 2019) which was tabled during the 2019 Review of the Dust Diseases Scheme was obtained from routinely collected administrative data, including hospital admissions and deaths from silicosis. The limitations of this case finding approach were described in the report, and included:

- Potential inaccuracies in the coding of silicosis among people admitted to hospital or who have died.
- 2018 is the most recent year with complete data for admitted patient, emergency department and deaths register.
- 2017 is the most recent year for which cause-specific mortality data are available.

Based on this report, it can be reasonably established that prior to 1 July 2020, accurate numbers of patients with silicosis who were admitted to hospital due to silicosis or who died as a result of silicosis in hospital, were not readily available and were limited in their interpretive use for accurate case finding.

For the purposes of the current case finding study, on 18 March 2021 Health Protection NSW (NSW Health) provided a new dataset to SafeWork NSW describing the following:

- Total hospitalisations due to silicosis (by financial year) for the period 2005-06 to 2019-20
- First time hospitalisations due to silicosis (by financial year) for the period 2005-06 to 2019-20
- Deaths due to silicosis (by calendar year) for the period 2005 to 2018.

In the explanatory notes provided with the dataset, NSW Health noted that the data were obtained using similar methods, and have similar caveats and limitations, as the report “*Hospital admissions and deaths from silicosis in NSW*” dated 1 October 2019. Differences in the scope of records, and the inclusion or exclusion criteria used, are likely to be responsible for differences between the earlier report and the current data presented.

Based on the differences in search criteria between the two datasets, data presented in the Health Protection NSW report dated 1 October 2019 have not be considered for this case finding study; the 18 March 2021 dataset is considered to be based on a better-defined search criteria.

The International Classification of Diseases (ICD)-10 code J62.8 (pneumoconiosis due to other dust containing silica) was used as the search criteria to locate NSW residents with a primary or secondary diagnosis of silicosis within the hospital admissions data. More specific details regarding the search criteria have not been made available to this study. However, it is understood that it is not occupation (manufactured stone industry) specific. This information was requested, however Health Protection NSW advised that information pertaining to occupation is not routinely collected nor available in NSW Health administrative data.

The limitations associated with the NSW Health data are discussed in Section 12.0.

6.3 Work Health and Safety Regulator – SafeWork NSW

SafeWork NSW has sought to ensure that manufactured stone industry persons conducting a business or undertaking (PCBUs) and workers (and other industries) who are potentially exposed to crystalline silica have been made aware of the risks of exposure to respirable crystalline silica. SafeWork NSW has sought to achieve this through awareness raising and workplace inspection campaigns.

As discussed in Section 4.0 the SafeWork NSW campaign began in 2017 in line with their objectives and strategic plans which identified crystalline silica as a priority hazardous chemical. The campaign was

immediately escalated when reporting of silicosis cases in manufactured stone workers occurred. Publicly available information is available regarding the inspection campaign through the silica dashboard¹⁰.

Further information about the SafeWork NSW inspection campaign has been made available to this study for the reporting period. This information provides insights into the size of the industry, the scale of SafeWork NSW's regulatory intervention, and case numbers reported among manufactured stone industry workers via health monitoring reporting, icare NSW screening and reporting, and NSW Health information presented to the legislative reviews of the dust disease scheme in 2019.

¹⁰ <https://www.nsw.gov.au/customer-service/publications-and-reports/silica-dashboard>

7.0 SILICOSIS CASE FINDING – ICARE NSW DATA

7.1 Data provided

Data provided by icare NSW for the purposes of this case finding study included the following for the reporting period:

- Total number of workers certified with silicosis by icare NSW
- Number of workers in each disability and age category
- Number of workers in each disability category by industry type
- Number of workers in each category of silicosis type
- Number of workers in each category for silicosis type by industry/occupation.

7.2 Trend in silicosis case numbers certified by icare NSW across all industries and occupations

While not specific to the manufactured stone industry, this section provides important insights into the timing of the identification of the recent emergence of silicosis in NSW, as reported by icare NSW across all industries and occupations.

The icare NSW Annual Report 2019-20 (icare NSW, 2020) states that medical screening services were increased during the reporting period to support the detection of silicosis in exposed workers, particularly those in the manufactured stone industry. These services included a subsidised screening program offered to workers in the manufactured stone industry for a further 12 months.

The number of silicosis cases reported by icare NSW (icare NSW, 2017; icare NSW, 2018; icare NSW, 2020) for the reporting period and the previous five years is presented in Figure 2. The annual case numbers were relatively consistent between 2012 and 2017, with an average of 8.7 cases for workers of all ages observed.

The sharp rise in the detection of silicosis cases identified during 2018-19 and 2019-20 can be attributed to the following SafeWork NSW and icare initiatives:

- The commencement of targeted workplace inspections by SafeWork NSW in March 2018, as part of the SafeWork NSW five-year strategy aimed at the manufactured stone industry.
- Introduction of an increase in medical screening services and routine CT scans in 2018 to support the detection of silicosis in workers with potentially significant levels of exposure to respirable crystalline silica.

The delay between the unrestricted peak use of manufactured stone in NSW (presumably during the last 10-15 years) and the identification of the recent emergence of silicosis in NSW, is a function of the latency of silicosis. In the absence of such heightened awareness and increased screening initiatives, silicosis may have continued to go undetected in NSW manufactured stone industry workers because exposed workers may have only presented for medical assistance once they were symptomatic, and the disease well-progressed.

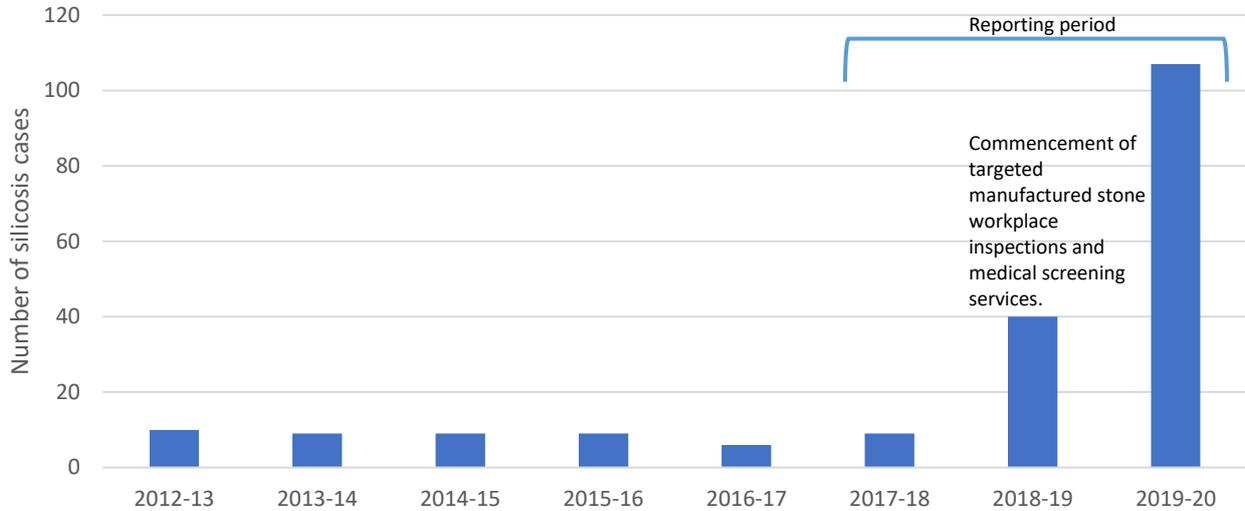


Figure 2: Silicosis cases for all industries and occupations reported by icare NSW for the last eight financial years. (Source: icare NSW Annual Reports for 2016-17, 2017-18, 2018-19 and 2019-20).

7.3 Manufactured stone industry workers screened for silica exposure

The number of workers screened for silica exposure by icare NSW during each financial year is presented in Figure 3. This data includes workers who were screened through the icare NSW workplace screening program, and those who applied directly to icare NSW for medical screening services. The number of workers screened per financial year may include follow-up screenings of workers that were screened during the previous year. Therefore, these data are likely to be indicative of the number of worker screening events, rather than individual workers that were screened.

During the reporting period, a total of 3,030 workers from all industries were screened for silica exposure by icare NSW. Of the total number of workers screened, 696 (23%) worked in the manufactured stone industry. In 2017-18, manufactured stone industry workers were not identified in the medical screening data. In 2018-19, however, icare NSW medical screening services were increased to support the detection of silicosis in exposed workers in the manufactured stone industry following on from SafeWork NSW’s campaign and issuing of improvement notices for workplace health monitoring. This resulted in a 178% increase in the number of workers presenting for screening in 2018-19.

In 2018-19 and 2019-20, the numbers of manufactured stone workers presenting for screening were 356 and 340, respectively. Although the total number of workers screened in 2019-20 was slightly less than the previous year, a slight increase in the proportion of manufactured stone workers represented in the total screening numbers was observed. The lower number of icare NSW screenings in 2019-20 may be a result of a three-month closure of the screening clinic during April, May, and June of 2020 due to COVID-19 pandemic response restrictions.



Figure 3: Manufactured stone workers and all other workers screened by icare NSW during the reporting period.

7.4 Manufactured stone industry workers certified with silicosis by icare NSW

The number of manufactured stone workers certified with silicosis by icare NSW during each financial year is presented in Figure 4.

A total of 156 workers across all industries were certified with silicosis during the reporting period, including 88 (56%) workers from the manufactured stone industry. During the 2017-18 financial year, there were no cases of manufactured stone-related silicosis identified through icare's health monitoring screening or through direct applications to icare NSW. The fact that there is no manufactured stone industry-specific silicosis data available prior to 2018-19 is a strong indicator that silicosis had remained dormant within this industry.

Despite the similar number of manufactured stone workers screened during 2018-19 and 2019-20 years (i.e. 356 and 340, respectively, (Figure 3), the number of silicosis cases markedly increased from 17 cases in 2018-19 to 71 in 2019-20. This spike may be an artefact of the lag between initial screening and silicosis certification by icare NSW. For example, a proportion of manufactured stone workers may have been screened for the first time during 2018-19, but not certified until 2019-20. It is therefore possible that a proportion of 2018-19 workers presenting for screening, and subsequently certified with silicosis, are represented in the following year.

Furthermore, given that 2018-19 was the very first year in which the manufactured stone industry was targeted by SafeWork NSW and that workers at high risk of exposure were referred to icare NSW for screening, it is plausible that a high proportion of workers with silicosis presented for screening during the 2018-19 financial year. If this is the case, it could be reasonably expected that the number of silicosis cases reported in subsequent financial years will stabilise. On-going annual reporting on silicosis case numbers will allow any trends to be investigated to confirm if the increase in case numbers was an artefact of the enforcement of screening within the manufactured stone industry by SafeWork NSW and icare.

Based on the latency of silicosis, it is important for all silica-exposed workers with no recent diagnosis to continue to be monitored as they may develop disease in the future.

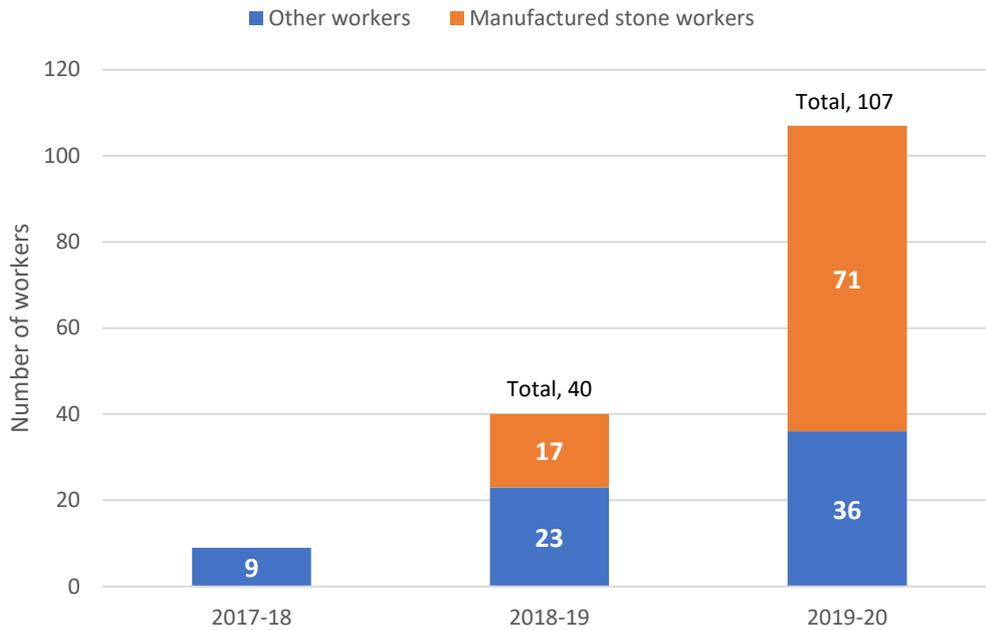


Figure 4: Manufactured stone industry workers and all other workers certified with silicosis by icare NSW during the reporting period.

While the scope of this case finding study is limited to workers with confirmed occupations within the ‘**manufactured and natural stone**’ and ‘**manufactured stone**’ industries, it is worth noting that within the additional industries listed in Table 2 there are 23 ‘**stonemasons**’ and three ‘**stone processing**’ workers that may have had exposure to respirable crystalline silica due to handling manufactured stone products.

Table 2: Industry and associated occupations of workers certified with silicosis, as recorded by icare NSW.

Industry	Occupations	Number of Workers
Manufactured & Natural Stone	Installer; Machine Operator; Polisher; Stonemason; Working Director	35
Manufactured Stone	Bridge Saw Operator; CNC Machine Assistant; Installer; N/A; Stonemason; Supervisor/Manager; Working Director	53
Natural Stone	Stonemason	2
Brick Manufacturing	Quality Control Inspector	1
Concrete Cutting	Owner/Operator	1
Construction and/or Demolition	Business Owner; Machine Operator; Stonemason	3
Cement Plant	Labourer	1
Manufacturing	Stonemason	1
Mining	Various	1
Tunnelling	Superintendent; Tunneller	6

Industry	Occupations	Number of Workers
N/A	Boilermaker; Bus Driver; Carpenter; Concreter; Driver; Excavation Worker; Farmworker; Foreman/Operations Foreman; Furnaceman; General Construction Plant Operator; Labourer; Process Worker; Proprietor; Stonemason; Stone Processing ; Team Leader; Truck Driver / Concrete Batchers; Sub-contractor; Tunneller; Working Director.	52
	Total	156

7.5 Incidence of silicosis among screened manufactured stone industry workers

Disease incidence is used to measure the occurrence of new cases of disease in a particular population over a specified timeframe.

The proportion of manufactured stone workers certified with silicosis by icare NSW among the cohort of manufactured stone industry workers screened during the three-year reporting period, is presented in Table 3. Of the 696 manufactured stone industry workers screened for silicosis, 88 were certified with the disease which equates to an incidence rate of 0.126 (12.6%) among these workers. By comparison, the incidence of silicosis observed among workers from all other industries was notably lower at 0.029 (2.9%).

The relative risk (risk ratio) of manufactured stone industry workers contracting silicosis was calculated to be 4.3 when compared to workers among other industries. In other words, during the reporting period manufactured stone industry workers in NSW were 4.3 times more likely to be certified with silicosis compared with workers among all other industries. This finding is indicative of the increased relative risk of silicosis specifically among manufactured stone industry workers in NSW.

It is worth noting that among the 456 manufactured stone industry workers screened for silicosis in Victoria, 133 (29%) cases of silicosis were identified between mid-May 2019 to the end of July 2020 (Monash University, 2020). Compared with Victoria, the occurrence of silicosis among manufactured stone workers during the entire reporting period in NSW (12.6%) is notably lower, however it is comparable to the 2019-20 financial year in which 20.9% of manufactured stone industry workers screened were certified with silicosis.

In contrast, a South Australian study reported that of the 295 workers who consented to the use of their data, there were 18 cases of probably, possible or confirmed simple silicosis, equating to a comparatively lower incidence of 6.1% (Government of South Australia, 2020).

It should be noted, however, that the methods of collecting and reporting data differ between jurisdictions, and so any comparison should be made with a degree of caution.

Table 3: Incidence of silicosis among manufactured stone workers screened during the reporting period. (July 2017 – June 2020)

Manufactured Stone Industry	FY 2017-18	FY 2018-19	FY 2019-20	Total
Cases among manufactured stone industry workers	0	17	71	88

Manufactured Stone Industry	FY 2017-18	FY 2018-19	FY 2019-20	Total
Total manufactured stone industry workers screened	Unknown	356	340	696
Proportion (incidence)	Unknown	4.8%	20.9%	12.6%
Other Industry	FY 2017-18	FY 2018-19	FY 2019-20	Total
Cases among all other industry workers	9	23	36	68
Total of all other industry workers screened	501	1039	794	2334
Proportion (incidence)	1.8%	2.2%	4.5%	2.9%
Relative risk		FY 2018-19	FY 2019-20	FYs 2018-20
	-	$4.8 / 2.2 = \mathbf{2.1}$	$20.9 / 4.5 = \mathbf{4.6}$	$12.6 / 2.9 = \mathbf{4.3}$
A relative risk greater than one means there is an increased risk of silicosis from working in the manufactured stone industry relative to working in another industry which conducts health screening for silicosis.				

7.6 Estimated incidence of silicosis in the manufactured stone industry

While disease incidence is used to measure the occurrence of new cases of disease in a population over a specified timeframe, disease prevalence is a measure of the proportion of a population that have a disease during a specified timeframe.

The aim of this section is to provide an estimate of silicosis incidence in the manufactured stone industry during the reporting period based on the number of new cases of silicosis certified by icare NSW. Silicosis incidence can be estimated by dividing the total number of new cases (i.e. 88 cases) by the total number of workers at risk (i.e. the number of manufactured stone workers in NSW). For the purposes of this calculation, an estimate of the number of manufactured stone workers in NSW was required.

SafeWork NSW estimates that there are 255 manufactured stone fabrication sites in NSW. The number of manufactured stone workers at each site, as estimated by SafeWork NSW, are described below:

- 60% of sites have between 0 and 5 workers (small site)
- 20% of sites have between 6 and 10 workers (medium site)
- 20% of sites have 11 or more workers (large site).

To calculate silicosis incidence, three different scenarios based on industry size have been modelled:

1. Most conservative approach assumes the minimum number of workers at each site (i.e. 1, 6, and 11 workers at small, medium and large sites, respectively).
2. Mid-conservative approach assumes the average number of workers at each site (i.e. 2.5 and 8 workers at small and medium sites; an increment of an additional 2 workers was selected for large sites, equating to 13 workers).
3. Least conservative approach - assumes the maximum number of workers at each site (i.e. 5, 10 at small and medium sites; an increment of an additional 2 workers was selected for large sites, equating to 15 workers).

As shown in Table 4, based on the estimates of workers at each site, the average number of manufactured stone workers across the state, based on the mid-conservative approach, was calculated to be 1459. The minimum and maximum number of manufactured stone workers across the state were calculated to be 1024 and 2048, respectively.

Based on the mid-conservative approach, the incidence of silicosis among 1459 manufactured stone workers for the reporting period is estimated to be 0.06 or 6%. Based on the most conservative approach, the incidence of silicosis could be as high as 0.9 or 9%; or as low as 0.4 or 4% based on the least conservative approach.

Table 4: Incidence of silicosis among NSW manufactured stone industry workers, based on three different assumptions for site size.

Approach	Assumption	Workers at small site	Workers at medium site	Workers at large site	Manufactured stone workers in NSW	Incidence rate based on 88 new cases (%)
Most conservative	Minimum number of workers at each site	153	306	561	1020	0.09 (9%)
Mid-conservative	Average number of workers at each site	383	408	663	1454	0.06 (6%)
Least conservative	Maximum number of workers at each site	765	510	765	2040	0.04 (4%)

The incidence of silicosis is an important metric that may be used to track the rate of new silicosis occurrence within the manufactured stone industry. Without a more accurate and validated number of workers within the manufactured stone industry, a reliable measure of incidence of silicosis will be difficult to achieve.

7.7 Number of certified silicosis cases by manufactured stone occupation

Data provided by icare NSW regarding the occupation of manufactured stone industry workers certified with silicosis included financial years 2018-19 and 2019-20 only. Manufactured stone industry workers were either (i) not represented or (ii) not clearly identified as working in the manufactured stone industry in the 2017-18 icare NSW data.

The numbers of silicosis cases identified among different occupations within the manufactured stone industry during both financial years 2018-19 and 2019-20 are presented in Figure 5. The majority of manufactured

stone workers certified with silicosis were stonemasons (70%), followed by manufactured stone installers (15%). Based on the activities associated with these two occupations, it could be reasonably expected that during the course their work activities, stonemasons and manufactured stone installers handle and work directly with manufactured stone products.

It is worth noting that manufactured stone workers in management roles are also represented among those certified with silicosis at 7%. It can be reasonably assumed that workers strictly in management roles are not likely to be exposed to the high levels of respirable crystalline silica as those working directly with manufactured stone, such as stonemasons and installers. It is possible, however, that workers who identify as managers had worked as stonemasons or installers in the past, and therefore have prior high-level exposures to respirable crystalline silica. Alternatively, workers who identify as managers may be owner-operators who perform the same tasks as stonemasons and installers, and therefore have similar exposures as these workers.

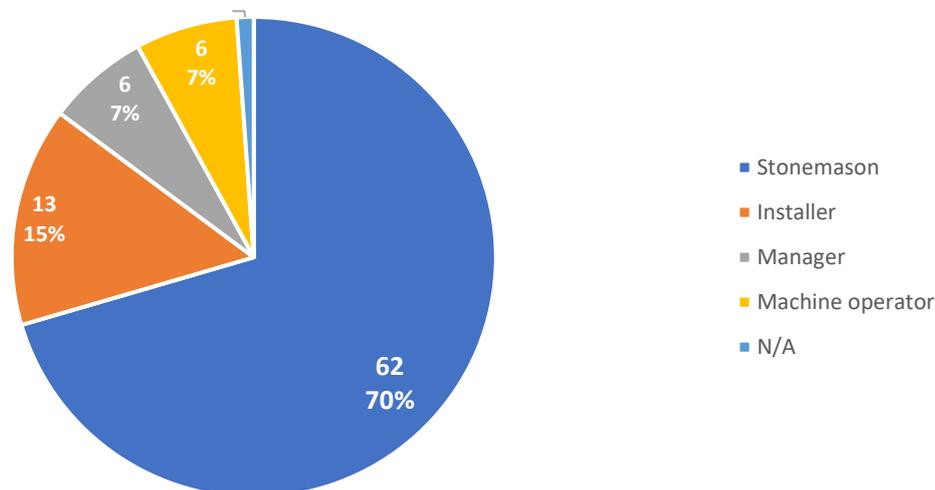


Figure 5: Proportion of icare NSW-certified cases in each manufactured stone occupation type the financial years 2018-19 and 2019-20 only.

Note: Manufactured stone workers were not identified or represented in the 2017-18 financial year.

Note: 'Machine operator' includes workers who identified as 'bridge saw operator' and 'CNC machine assistant' and 'polisher'.

'Manager' includes workers who identified as 'supervisor/manager' and 'working director'.

'N/A' as provided in icare data.

7.8 Types of silicosis reported in manufactured stone industry workers

The forms of silicosis reported by icare NSW are consistent with the forms that are described in Section 3 (see Table 1 for a description of each form).

Data provided by icare NSW regarding the form of silicosis identified for individual manufactured stone workers included financial years 2018-19 and 2019-20 only. Manufactured stone workers were either (i) not represented or (ii) not clearly identified as working in the manufactured stone industry in the 2017-18 icare NSW data.

As presented in Figure 6, the majority (72%) of silicosis cases observed among manufactured stone industry workers that were certified by icare NSW during financial years 2018-19 and 2019-20 were diagnosed with the chronic simple form. Chronic simple silicosis was represented across all manufactured stone occupations (Figure 7).

Accelerated silicosis was the second most prevalent form of silicosis (17%) reported by icare NSW, and was identified in stonemasons, manufactured stone installers, and machine operators.

It was not until 2019-20 that chronic complicated silicosis (9%) and acute silicosis (2%) were detected in manufactured stone workers. It is likely that the identification of these silicosis types during financial year 2019-20 is a result of the higher number of silicosis cases certified, compared with the 2018-19 financial year. Chronic complicated silicosis and acute silicosis were identified in stonemasons and manufactured stone installers only (Figure 7).

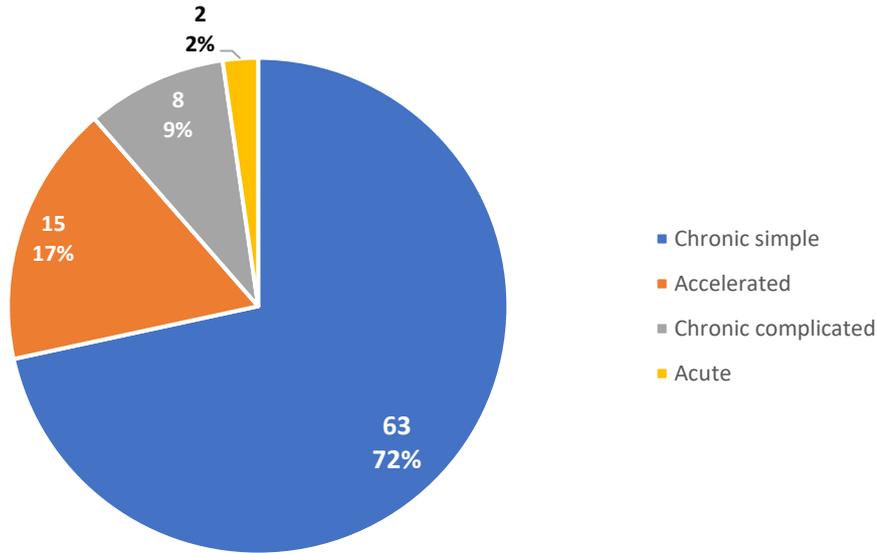


Figure 6: Proportion of manufactured stone workers with each silicosis type reported by icare NSW during the reporting period.

Note: Manufactured stone workers were not identified or represented in the 2017-18 financial year.

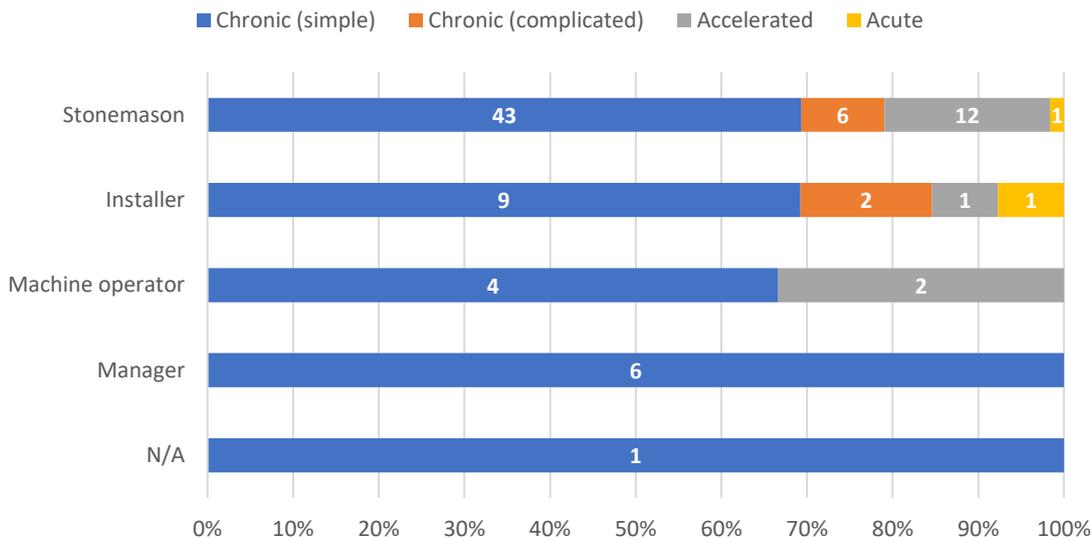


Figure 7: Proportion of manufactured stone workers in each occupation category certified with the different forms of silicosis (number of cases also displayed).

Note: 'Machine operator' includes workers who identified as 'bridge saw operator' and 'CNC machine assistant' and 'polisher'. 'Manager' includes workers who identified as 'supervisor/manager' and 'working director'. 'N/A' as provided in icare data.

Similar results were reported in manufactured stone workers in Victoria, however, a greater number of workers with the more advanced forms of the disease were identified (Monash University, 2020). Chronic simple silicosis was the most common type of silicosis diagnosed (54%), followed by accelerated simple silicosis (20%), chronic complicated silicosis (16%), and accelerated complicated silicosis (9.6%) (Monash University, 2020).

As discussed in Section 3.0, the chronic form of silicosis has a latency period of greater than 10 years (can be up to 30 years) and is a result of low-level exposure to respirable crystalline silica. Workers with chronic simple silicosis may transition to the chronic complicated type as the disease progresses over time (Hoy & Chambers, 2020). For example, in a follow-up study of 106 native Spanish manufactured stone workers diagnosed with simple silicosis, 37.7% had rapidly progressed to the progressive massive fibrosis (complicated silicosis) within an average of 4 years (Leon-Jimenez, et al., 2020). Therefore, data for the two chronic types of silicosis are only applicable to the time of reporting and should not be considered static.

The identification of the accelerated and acute forms of silicosis indicates that workers in some manufactured stone workplaces were exposed to moderate to very high levels of respirable silica dust and contracted the disease between 5 and 10 years after their time of initial exposure. Disease progression for accelerated and acute silicosis is more rapid than the chronic form, and the mortality rate associated with the acute form is reportedly high (summarised in Hoy & Chambers, 2020).

7.9 Levels of disability due to silicosis reported in manufactured stone workers

The progression of silicosis is typically accompanied by incremental declines in lung function over time, and the severity is strongly linked to the levels of exposure to silica dust. The level of disability a worker may experience due to silicosis can be measured by the impairment, or functional loss, of the lung. Given that silicosis is a progressive disease (i.e. one that increases in its severity over time), the level of disability also increases over time.

The level of disability assigned by the icare NSW Medical Assessment Panel is reported as a percentage of lung function loss. The disability percentage assigned to a worker is commensurate with the amount of compensation paid, with compensation payments increasing with increasing level of disability assigned. It is important to note, however, that because silicosis is a progressive disease, the level of disability assigned to a worker increases incrementally with disease severity. Therefore, the levels of disability assigned to a worker are only applicable to the time of reporting and should not be considered static.

The disability categories provided by icare NSW were 1%, 5%, 10%, 20%, 30%, 40%, 50%, and 100%, but no workers in the icare NSW dataset had a reported disability level of 50% or greater. Given the low numbers of workers in the higher disability levels, data from the following disability levels were aggregated: 5-10% and 20-40%.

As shown in Figure 8, the vast majority (87%) of manufactured stone workers diagnosed with silicosis during the reporting period were assigned a disability level of 1%. Manufactured stone workers across all occupations were represented in this lowest level for disability (Figure 9). The proportion of workers in the 5-10% disability category (8%) were represented variably by stonemasons, manufactured stone installers and machine operators. Finally, only stonemasons were reported as having a disability level within the 20-40% range (Figure 8).

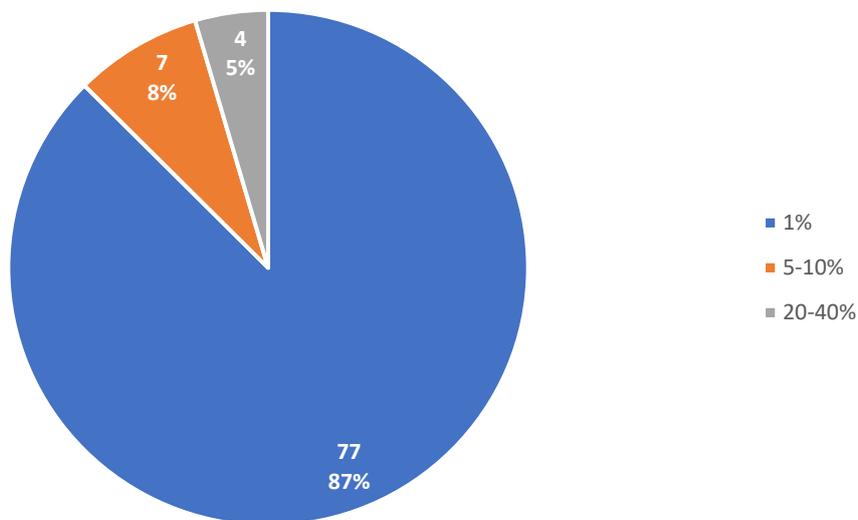


Figure 8: Proportion of manufactured stone workers at each disability level attributed to silicosis.

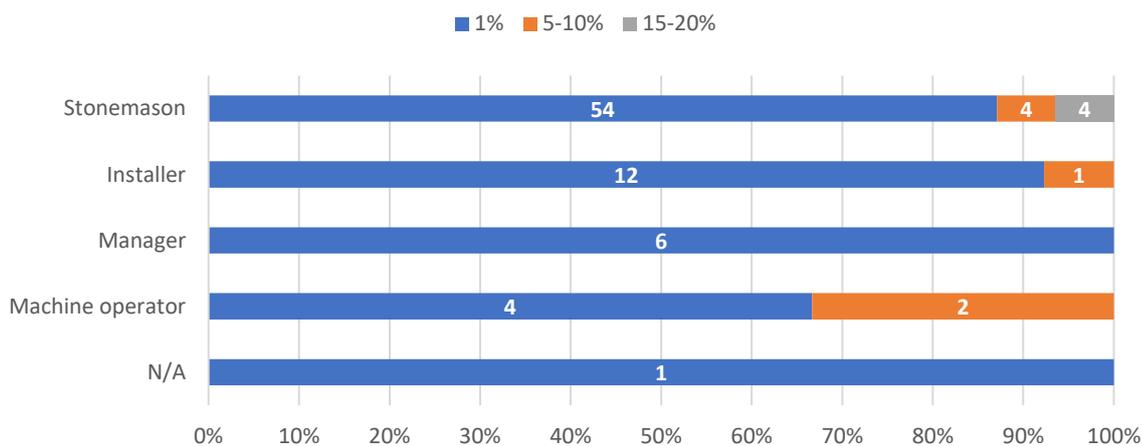


Figure 9: Proportion of manufactured stone workers at each disability level attributed to silicosis.

Note: 'Machine operator' includes workers who identified as 'bridge saw operator' and 'CNC machine assistant' and 'polisher'.

'Manager' includes workers who identified as 'supervisor/manager' and 'working director'.

'N/S' as provided in icare data.

8.0 CASE FINDING - NSW HEALTH

NSW Health silicosis data were extracted from the dataset entitled “*Data for release*” (Ministry of Health, March 2021). Hospital admissions and death represent the more severe stages of silicosis, and do not always include those who are in the early stages of the disease.

Since, 2020, when silicosis cases became a notifiable disease, a case definition has been defined by NSW Health as a medical condition under Part 4 of the NSW Public Health Act 2010. Prior to 2020, when a silicosis case was diagnosed, notification was not mandatory.

8.1 NSW hospital admissions due to silicosis

Although the focus of this case finding study is on the last three financial years prior to mandatory notification for silicosis (i.e. 2017-18, 2018-19, and 2019-20), NSW Ministry of Health hospital admissions data dates back to 2005-06, and therefore provides an indication of the trend in silicosis hospital admissions over time.

Basic statistics for the data provided by Health Protection NSW (within the NSW Ministry of Health) are presented in Table 5.

Table 5: Summary statistics for the number of admissions to NSW hospitals due to a primary or secondary diagnosis of silicosis from financial year 2005-06 to 2019-20

(Source, Admitted Patient, Emergency Department Attendance and Deaths Register, NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence, NSW Ministry of Health).

Admissions	Total number during 15-year reporting period	Average (mean) annual number of hospital admissions	Lowest number of hospital admissions (financial year)	Highest number of hospital admissions (financial year)
First-time hospital admissions	370	25	15 (2016-17, 2019-20)	37 (2005-06)
Total hospital admissions	952	63	39 (2016-17)	97 (2005-06)

The total number of first-time admissions to NSW hospitals for NSW residents with a primary or secondary diagnosis of silicosis for financial years 2006-06 to 2019-20 is presented in Figure 10. First time hospitalisations provide an indication of the number of individuals who have been admitted to hospital with silicosis for the first time and may be suggestive of changes in the incidence of disease. However, this first interaction with the health system may occur several years after developing the disease. Also presented in Figure 9 is the total number hospitalisations due to silicosis for each financial year during the 15-year period.

The total number of first-time hospital admissions during the 15-year period was 370, with an average of 25 per financial year. This average number of first-time presentations can be interpreted as a potential indication of a maximum number of silicosis cases per year from all industries¹¹. These industries include the manufactured stone industry, other industries recorded by icare NSW screening (e.g., tunnelling), and mine workers who are not covered by icare NSW. Hence, when compared to other annual rates of silicosis, this rate will appear high.

The highest number of new patients admitted during the reporting period was 37 during 2005-06, while the lowest number was 15, as reported during 2016-17 and 2019-20. The number of first-time hospital admissions have fluctuated over time, however a notable increase in hospitalisations occurred in 2017-18 whereby admissions doubled, compared to the previous financial year.

¹¹ Note: People exposed to dust and sand storms and people living in arid areas have been known to develop silicosis – however there is no evidence of this occurring in Australia.

With regard to the total number of hospital admissions, the data suggests an overall decreasing trend during the 15-year reporting period, during which a total of 952 hospital admissions were reported, with an average of 63 per financial year. During the 15-year reporting period, there has been a 57% overall decrease in the total number of hospital admissions due to silicosis, with 97 and 42 silicosis patients admitted in 2005-06 and 2019-20, respectively. In addition to the general downward trend in admissions, it is also important to acknowledge the variability among the data. For example, between 2010-11 and 2011-12, the total number of hospital admissions increased from 46 to 72 and remained above the 2010-11 financial year for five consecutive years.

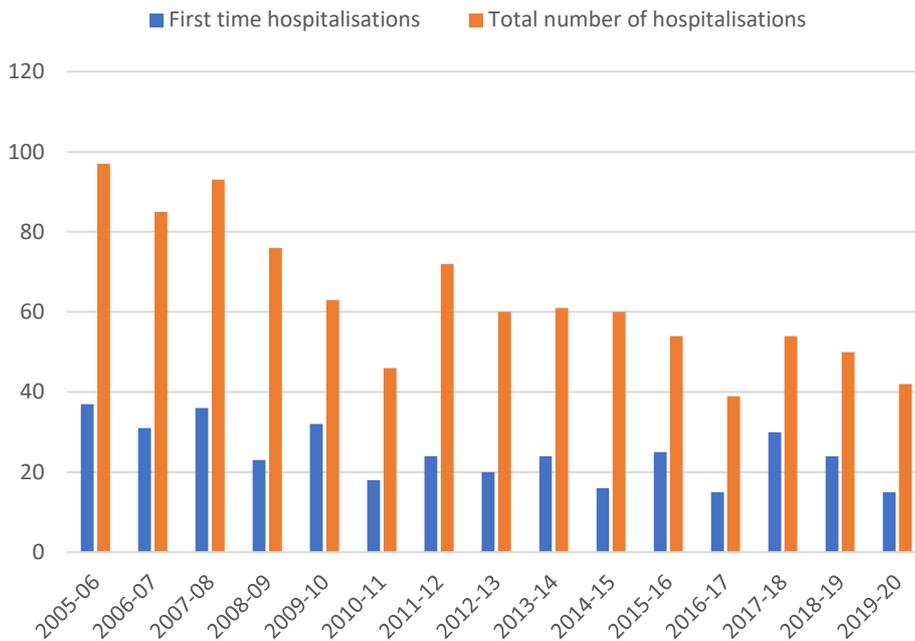


Figure 10: Number of admissions to NSW hospitals due to a primary or secondary diagnosis of silicosis from financial year 2005-06 to 2019-20

(Source, Admitted Patient, Emergency Department Attendance and Deaths Register, NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence, NSW Ministry of Health).

8.2 Age profile of patients hospitalised due to silicosis

The key aim of this case finding study was to identify NSW manufactured stone industry workers that have been diagnosed with silicosis. Although the March 2021 NSW Ministry of Health data does not provide details of the patient’s occupation or industry, changes in the age profile of the first-time admitted patient over time may provide indications as to whether contemporary industries (such as the manufactured stone industry) have impacted upon the number of hospital admissions due to silicosis.

Table 6 and Figure 11 clearly show that the vast majority (86%) of first-time hospital admissions due to silicosis are represented by patients in the three most senior age categories. The fact that 64% of all first-time hospital admissions were greater than 70 years of age indicates that a substantial number of patients of retirement age and/or retirees are requiring hospitalisation due to silicosis. It is unlikely that these patients are currently working in the manufactured stone industry.

When adjusted to represent only workers aged 65 and under, the average first-time hospitalisation annual rate of 25 cases per year decreases to approximately 6 cases per year. This adjusted annual rate is lower than the reported icare NSW rate identified in Section 7.2, of 8.7 cases per year (prior to 2018). However, the icare NSW data comprises silicosis cases of all ages and includes, as intended, screening of all workers in industries where crystalline silica exposure is a potential and hence, non-symptomatic cases may be identified that would not ordinarily be identified in workers presenting to hospital.

Patient numbers are relatively small and trends difficult to identify. Within the data it can be observed that from 2014-15 onwards, there has been an increase in the number of patients in younger age categories admitted to hospital due to silicosis. For example, Figure 11 indicates that there was a notable increase in the proportion of 50–59-year-old patients admitted to hospital between 2013-14 (2 admissions) and 2015-16 (16 admissions). After 2015-16, there is also an increase in the proportion of admitted patients aged between 40-49 years.

Notably, it was only in the last five financial years that a patient in the youngest age category of 20-29 years was admitted to hospital due to silicosis.

Table 6: Summary statistics for the number of first-time admissions to NSW hospitals due to a primary or secondary diagnosis of silicosis from financial year 2005-06 to 2019-20 by age category

(Source, Admitted Patient, Emergency Department Attendance and Deaths Register, NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence, NSW Ministry of Health).

Age Category (years)	Total number during 15-year reporting period	Percentage of total first-time admissions
20-29	1	0.3%
30-39	7	2%
40-49	14	4%
50-59	29	8%
60-69	82	22%
70-79	132	36%
80+	105	28%

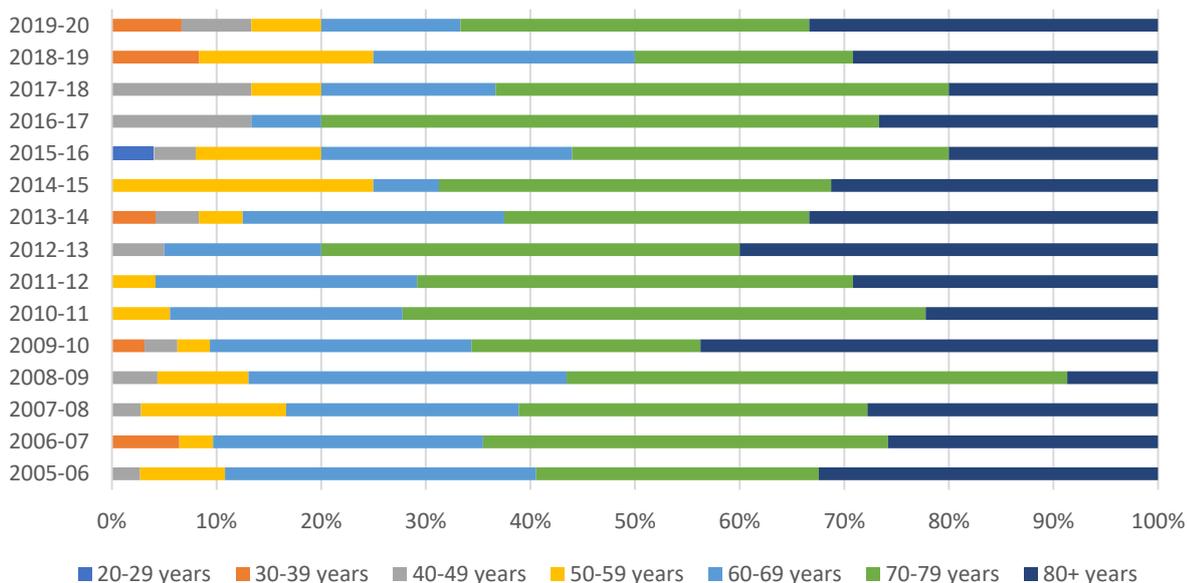


Figure 11: Proportion of workers in each age category admitted to NSW hospitals due to silicosis from financial year 2005-06 to 2019-20

(Source, Admitted Patient, Emergency Department Attendance and Deaths Register, NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence, NSW Ministry of Health).

Applying a rolling average (Figure 12) to first time hospitalisations for workers aged under 50 years of age assists in observing an average increase of hospitalisations from 2012-13 to 2019-20. As the data does not include exact ages of the cases (hospitalised workers) identified, nor their occupation or work history (potential exposure), or diagnosis, it is not possible to determine any trends in the type of silicosis (acute, accelerated, chronic) that these workers under 50 years of age are presenting to hospital with, nor if they are specific to the manufactured stone industry. Krefft (Krefft, et al., 2020) suggests evidence of all silica related disease (especially acute and accelerated silicosis) serve as a sentinel health event which may require consultation with public health agencies and the workplace regulator is essential and will enable investigation of similarly exposed co-workers who may also be at risk.

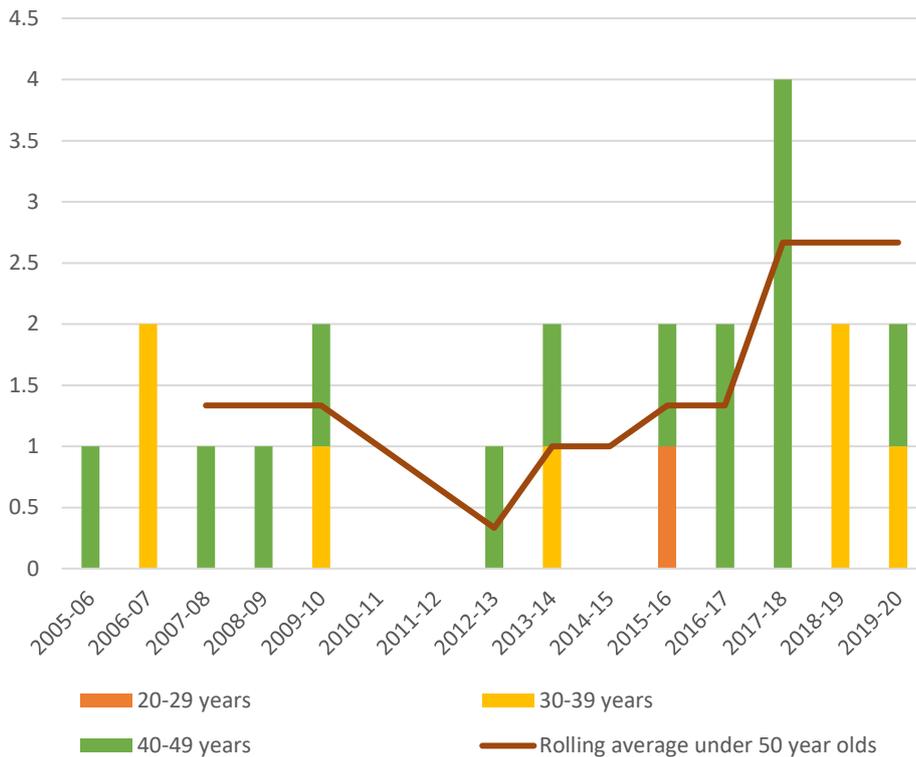


Figure 12: First-time hospitalisation of workers aged under 50 years from financial year 2005-06 to 2019-20 with 3-year rolling average.

(Source, Admitted Patient, Emergency Department Attendance and Deaths Register, NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence, NSW Ministry of Health).

8.3 Number of deaths attributed to silicosis

A total of 113 deaths in NSW were attributed to silicosis between calendar years 2005 and 2018, according to the Cause of Death Unit Record File held by the NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence.

The data presented in Figure 13 is highly variable and does not suggest any clear trend in the number of deaths attributed to silicosis. The average number of deaths per year across this period is approximately 8 per year. The maximum number of deaths attributed to silicosis in any given year were recorded in 2005 and 2013, where 12 deaths were observed for each year. The minimum number of deaths, reported as less than (<) 5, were observed in 2010, 2016, and 2018.

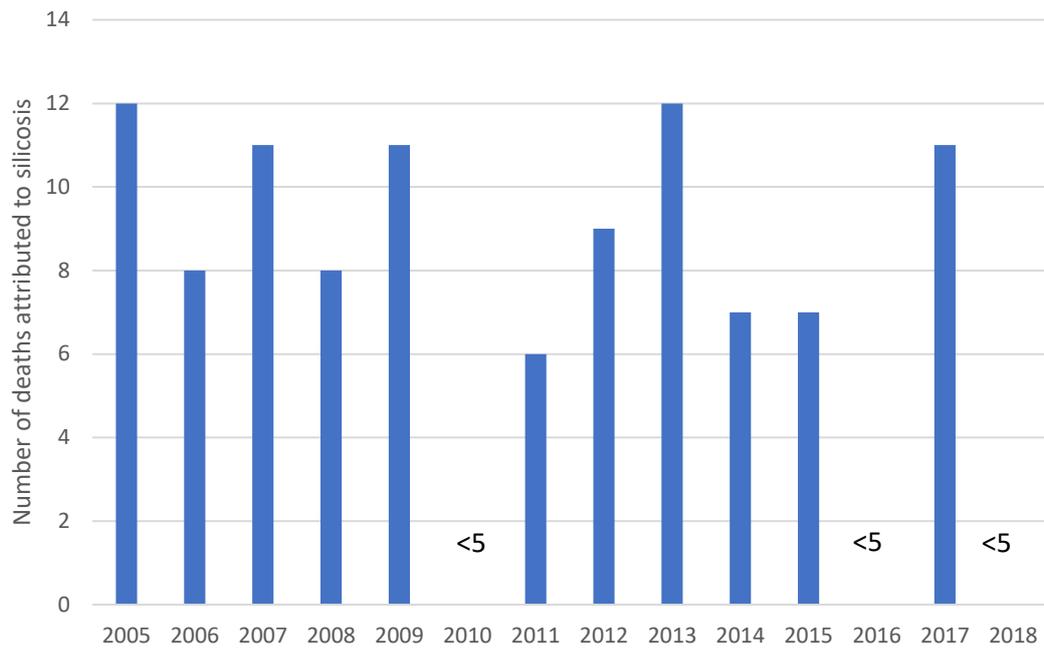


Figure 13: Number of deaths attributed to silicosis from 2005 to 2018.

(Source: Cause of Death Unit Record File held by the NSW Ministry of Health Secure Analytics for Population Health Research and Intelligence. The Cause of Death Unit Record File (COD URF) is provided by the Australian Coordinating Registry for the COD URF on behalf of the NSW Registry of Births, Deaths and Marriages, NSW Coroner and the National Coronal Information System).

9.0 CASE FINDING - SAFEWORK NSW

Over the study period, SafeWork NSW conducted 644 visits to the approximately 255 manufactured stone fabrication facilities in NSW. SafeWork NSW's inspections have established that most manufactured stone workers are stonemasons who conduct fabrication and installation activities. Approximately 85% of workers fabricate and install (end-to-end), with approximately 15% of workers doing fabrication only and sub-contract to installers. Smaller businesses tend to undertake both fabrication and installation work, while larger companies generally have a dedicated group of installers who are often sub-contracted. A limited number of workers/businesses focus only on installation work (sub-contractors). Hence, the industry can be seen as mainly stonemason fabricators who control the flow of work to the installers.

9.1 Manufactured Stone Industry Locations

In 2019, manufactured stone industry facilities in NSW were located primarily in metropolitan Sydney (approximately 192 facilities, 75%) (Appendix B, Figure 1) and regional centres (approximately 63 facilities, 25%) (Appendix B, Figure 2). Approximately 45% of all the locations were in the south-western Sydney local government areas of Liverpool City Council, Canterbury Bankstown Council and Fairfield City Council, and Campbelltown City Council, all of which are in the South-Western Sydney Local Health district.

Based on SafeWork NSW estimates of the number of workers at each manufactured stone facility, the total number of manufactured stone workers in NSW has been modelled in Section 7.6 (Table 4), and ranges between 1024 and 2048 (average, 1459). The distribution of workers across the facilities in NSW is expected to be proportionate to the distribution of facilities, hence there are likely to be approximately 75% of manufactured stone workers in metropolitan Sydney (between 768 and 1536, average 1,094) and 25% spread across regional NSW (between 256 and 512, average, 364).

- Metropolitan areas, 75% equates to approximately 1,100 manufactured stone industry workers (maximum total), with approximately 650 of these workers, working in industrial areas of South-Western Sydney.
- Regional areas, 25% equates to approximately 500 manufactured stone industry workers (maximum total), working in relatively small-scale operations across 26 different regional centres.

9.2 Health Monitoring conducted by PCBU

Health monitoring of workers can assist to detect the number of workers who are exposed to crystalline silica who may have a disease. It is therefore an essential part of case finding.

SafeWork NSW's inspection campaign has sought to ensure that health monitoring is occurring as required.

During Stage 1 (up to 30 June 2019), SafeWork NSW issued 699 notices to manufactured stone industry facilities, 531 related to silica exposure issues. 125 of these notices required the PCBU to provide health monitoring to manufactured stone facility workers. With 125 notices issued to 255 PCBU/facilities, this suggests that at least 49% of manufactured stone facilities were identified as having not met their duty to provide health monitoring as required under Division 6 of the *Work, Health and Safety Regulation 2017*.

The SafeWork NSW inspection campaign was combined with the icare NSW offer of free health screening assessments to facilitate prompt health monitoring of workers. This combination of notices and subsidised screening led to the substantial increase in health screening that has occurred.

Stage 2 of the ongoing SafeWork NSW inspection campaign (from July 2019 to current – April 2021) has served 141 notices (at the time of reporting) related to silica exposure. 17 of these improvement notices related to health monitoring. 13 of these 17 notices were for repeat PCBU who had failed to monitor new workers who had started after the Stage 1 inspections. With 17 notices issued to 125 PCBU/facilities and 50% of facilities had been inspected during Stage 2 at the time of reporting suggests that at least 14% of manufactures stone facilities were identified as not having met their duty to provide health monitoring as required under Division 6 of the *Work, Health and Safety Regulation 2017*.

SafeWork NSW is aiming for all PCBU/facilities to proactively meet their health monitoring obligations.

9.3 Health monitoring cases

As discussed in detail below, since 1 July 2020, SafeWork NSW receives silicosis notifications from NSW Health on a quarterly basis. Many factors contributed to this regulatory change, including the low rates of health monitoring screening and reporting notifications by PCBUs. Anecdotally, multiple factors such as workforce organisational culture (power imbalances), utilisation of unskilled CALD workforce (Hall & Partners, 2021), contributed to workers and PCBU's choosing not to either provide health monitoring for workers and/or not report the results to SafeWork NSW, despite the regulatory requirement.

SafeWork NSW identified manufactured stone industry worker silicosis cases from the health monitoring reports made by PCBUs over the reporting period and for the first 6 months of financial year 2020-21. These cases are presented in Table 7. All of these cases have come through the icare NSW screening program and thus the cases are counted in the icare NSW data and are not additional cases.

The small number of screenings limit interpretation of the data. The increase in PCBUs reporting of cases to SafeWork NSW over the reporting period is observed. This continues into the first 6 months of the financial year 2020-21 where 6 PCBUs have provided health monitoring reports to SafeWork NSW identifying 5 cases from within the manufactured stone industry. This is substantially lower than 12 manufactured stone industry worker cases notified by NSW Health under the new notification arrangement. However, the reporting period is not yet complete and SafeWork NSW is working with the manufactured stone industry to lift the compliance of both Health Monitoring screening and reporting. A similar but lower level of health monitoring reporting to SafeWork NSW by PCBUs (other than manufactured stone) in comparison to NSW Health notifications is observed across the other industries reporting silicosis cases.

One manufactured stone industry worker case is identified as having 30% lung impairment. icare and SafeWork NSW are in the process of conducting investigations into workplace safety and working with this facility, which also reported other cases, to improve work practices related to worker exposure to crystalline silica from working with manufactured stone. The authors understand that the SafeWork and icare investigations do not extend to contacting former workers who may have retired or changed workplaces.

Table 7: Manufactured stone worker cases reported to SafeWork NSW 2017 - 2020 from PCBU Health Monitoring notifications.

Financial Year	No. of PCBUs reporting Health Monitoring (all)	Manufactured Stone Facilities and Workers					
		No. of MS PCBUs reporting Health Monitoring and location (NSW)	MS Workers Screened	Cases (% of MS workers screened)	Severity	Sex	Age (Category - years)
2017-2018	2	0	0	0	-	-	-
2018-2019	3	1 Regional facility (33%)	3	3 (100%)	unknown (3)	all male	2 (30 - 39) 0 (40 - 49) 0 (50 - 59) 1 (60 - 69)
2019-2020	10	4 Metropolitan Sydney facilities (40%)	11	6 (54%)	unknown (4) 1% (1) 30% (1)	all male	2 (30 - 39) 2 (40 - 49) 2 (50 - 59)
2020 - 2021 (6 months only)	14	6 Metropolitan Sydney facilities (43%)	14	5 (36%)	unknown (2) 1% (3)	all male	0 (30 - 39) 4 (40 - 49) 1 (50 - 59)

SafeWork NSW identified that the very low level of compliance of PCBU's to provide health monitoring to workers and reporting was one of the key factors influencing their escalation and intervention, in response to the increase in worker exposure to crystalline silica. The failure of PCBU's to both reliably screen and report cases to SafeWork NSW led to the additional requirement to make silicosis diagnosis notifiable to NSW Health by medical physicians upon diagnosis of silicosis. This dual reporting process, when combined with the increase in compliance, will ensure that changes to case numbers are identified and managed early.

Regular worker screening via a health monitoring program is seen as one way to track exposure to crystalline silica in the manufactured stone industry. However, the regulatory experience demonstrates that this tracking process is only possible if the workers, industry, and the regulatory processes are sensitive to small changes in case numbers and responsive to multiple worker, industry, technology, market, and consumer demand factors, which are in a continuous state of change. Another way of tracking and managing worker exposure to respirable crystalline silica is via implementation of proactive occupational hygiene practices, including monitoring of personal exposure levels, and the institution of suitable workplace controls.

10.0 MANUFACTURED STONE PRODUCT STEWARDSHIP CONSIDERATIONS

Manufactured stone enters the Australian and NSW markets as an imported product. It is imported primarily by only a few international companies whose production facilities are located across the world.

10.1.1 Product Stewardship

Product Stewardship (“*cradle to grave*”) considerations are relevant to the manufactured stone industry and the protection of workers along the entire supply chain. Current Duty of Care legislation (Part 7.1 Hazardous Chemicals Division 2, Subdivision 1 of the *Work Health and Safety Regulation 2017*) requires manufacturers, importers, and suppliers of manufactured stone to have a duty of care to those who handle their products in NSW. Manufacturers of manufactured stone have a role in providing appropriate product stewardship measures to ensure risks are communicated clearly and information is provided on prevention and protective measures. (Standing Committee on Law and Justice, 2020) - Section 4.41

10.1.2 Waste Management of crystalline silica dust

Given that high quantities of silica dust are generated through the cutting, grinding and polishing of manufactured stone products, this waste product represents a potential risk to those workers who handle, store, or remove such wastes from manufactured stone fabrication facilities or from locations where manufactured stone has been installed. This study was not able to find evidence or advice to either the manufactured stone industry as to how they should manage their silica dust waste streams, or to the waste industry managers and workers as to how silica dust waste should be handled during collection and disposal, to prevent exposure.

11.0 CHANGES TO THE LEGISLATIVE FRAMEWORK

On 1 July 2020, the NSW Government introduced [reforms](#) to target silica exposure as part of a five-year strategy to reduce exposure to silica dust. The reform package acknowledged that the uncontrolled cutting and grinding of crystalline silica presents a serious risk to health, and included the following two notable provisions:

- Mandatory exposure standard reduced by 50%.
- Notification of silicosis diagnosis.

The legislative frameworks associated with silicosis notification, monitoring and reporting are important for understanding the nature of the post- 1 July 2020 reporting outputs. This section provides an overview of the legislative contexts in which silicosis is currently monitored and reported, and how the legislative contexts are interconnected.

11.1 Public Health (NSW Health)

The Public Health Act (2010) NSW requires that certain medical conditions be notified to public health authorities in NSW.

With effect from 1 July 2020, silicosis was scheduled as a medical condition listed under Category 2 in Schedule 1 of the Public Health Act 2010. Category 2 medical conditions are required to be notified by a registered medical practitioner if it is reasonably suspected that the person has the Category 2 medical condition, or if upon post-mortem examination, reasonably suspects that the person's cause of death involves a Category 2 medical condition.

Notifications of silicosis are required to be issued to NSW Health by the medical practitioner making the silicosis diagnosis.

After 1 July 2020, when silicosis became a notifiable medical condition under the Public Health Act (2010) [NSW], NSW Health published its [Control Guideline](#) for silicosis on the NSW Health website. The Control Guideline provides information regarding the disease, such as sources and pathways of exposure, along with disease symptoms and latencies, and preventative activities.

The Control Guideline notes that there is no single diagnostic test to confirm diagnosis, and as such, a diagnosis of silicosis requires a multiple lines of evidence approach including:

- Occupational history
- Clinical examination
- Respiratory function tests (FEV1, FVC, FEV1/FVC)
- Radiographic evidence (chest X-ray or CT scan).

Once a case has been diagnosed, medical practitioners complete a one-page [Silicosis Notification Form](#) to record the details of the patient. Information recorded in the Silicosis Notification Form includes:

- Patient details including basic socio-demographic information
- Type of silicosis (i.e. acute, chronic, or accelerated)
- Percentage of lung function impairment
- Diagnostic tests used to confirm diagnosis

- Primary industry (i.e. manufacturing, construction, other)
- Patient employment and employer details
- Most recent employment location where silica exposure occurred
- Other comments.

Once NSW Health has received a diagnosis from a medical practitioner (using the approved Silicosis Notification Form), the notification is stored using a user-restricted part of the records management system by the NSW Health, Environmental Health Branch. NSW Health issues the silicosis notifications to SafeWork NSW on a quarterly basis:

- 1 January to 31 March (14 April)
- 1 April to 30 June (14 July)
- 1 July to 30 September (14 October)
- 1 October to 31 December (14 January).

It is noted on the NSW Health website, that the NSW Health Notifiable Conditions Information Management System (NCIMS) is not currently used to record notifications of silicosis.

11.2 Work Health and Safety Regulator (SafeWork NSW)

The Work Health and Safety Act 2011 (NSW) and associated regulations require that a person conducting a business or undertaking (PCBU) to ensure, so far as is reasonably practicable, the health and safety of workers while in the workplace. Section 19(3)(g) details that as part of the primary duty of care, the health of workers and the conditions at the workplace are to be monitored for the purpose of preventing illness or injury.

In response to the re-emergence of silicosis in NSW, the NSW Parliament made [amendments](#) to the WHS Act in 2020 to introduce information exchange provisions requiring the Ministry of Health (Health Protection NSW) to notify SafeWork NSW with details of notifiable occupational dust diseases and deaths. Notifications to SafeWork NSW of cases or deaths from occupational dust diseases only arises where NSW Health receive a notification of a case or a death under the Public Health Act, 2010. An occupational dust disease is defined as a dust disease, as set out in the Workers' Compensation (Dust Diseases) Act 1942 (see Section 3.4.3), or any other respiratory disease or condition prescribed by the regulations.

The amendments also require that SafeWork NSW maintain a register and monitor the incidence of notifiable occupational dust diseases, and to facilitate the exchange of information with another Public Service agency.

SafeWork NSW is required to report to the Minister the number of cases of notifiable occupational dust diseases notified by NSW Health, the number of deaths resulting from notifiable occupational dust diseases, the actions that SafeWork NSW has taken to implement the purposes of the register, and any other relevant information SafeWork NSW considers appropriate.

In accordance with Section 276A of the amendment, SafeWork NSW is required to ensure that a case-finding study is carried out to (a) investigate respirable crystalline silica exposure in the manufactured stone industry, and (b) gather information to improve the identification and assessment of workers at risk of exposure. The report on the study findings must be completed on or before 1 July 2021.

In addition to the silicosis monitoring and reporting requirements made under the amendments to the WHS Act, the Work Health and Safety Amendment (Silica) Regulation 2020 NSW was published on 5 June 2020. This amendment requires that a person conducting a business or undertaking at a workplace must not direct or allow workers to cut manufactured stone containing crystalline silica with a power tool unless the worker is

wearing adequate respiratory protective equipment, and that adequate controls are in place to reduce the generation of silica dust.

11.3 Workers' Compensation (icare NSW)

The Workers' Compensation (Dust Diseases) Act 1942 (NSW) lists the dust diseases that are the subject of the Worker Health and Safety amendments. Silicosis is included in this list.

Under the Workers' Compensation (Dust Diseases) Act 1942 (NSW) it is the role of the Medical Assessment Panel to identify whether an applicant for compensation has a dust disease covered by the dust diseases compensation scheme. The Medical Assessment Panel consists of three legally qualified medical practitioners, appointed by the Minister.

Once the Medical Assessment Panel has identified that an applicant for compensation has a dust disease, the applicant is certified as totally or partially disabled for work. Where the Medical Assessment Panel certifies that a person has died due to a dust disease, the dependants of the person may be entitled to compensation.

icare NSW is required to notify NSW Health of silicosis cases identified by the Medical Assessment Panel.

11.4 Pathway and responsibilities for silicosis notification, reporting and monitoring

Based on the legislative requirements and data sharing arrangements with effect from 1 July 2020, the responsibilities are distributed as follows:

- Medical practitioners (including icare NSW physicians) – responsible for notifying a diagnosis of silicosis to NSW Health
- NSW Health – responsible for providing notification data to SafeWork NSW
- SafeWork NSW – responsible for investigating and following up workplaces where silicosis cases are identified.

12.0 SUMMARY OF FIRST SIX MONTHS OF SILICOSIS NOTIFICATIONS

This section provides a brief commentary on the first six months of silicosis notifications. These notifications were issued to SafeWork NSW by NSW Health and include notifications made by icare and other medical practitioners between 1 July and 31 December 2020. Data provided in the first six-monthly report are tabulated in Table 8, and include the following details:

- Total number of notified workers
- Basic demographic information including gender, age, and country of birth
- Industry / occupation of worker
- Form of silicosis (i.e. chronic, acute, or accelerated)
- Lung impairment (provided as a percentage)

Table 8: Summary of first six months (July 2020 – Dec 2020) from NSW Health silicosis notifications

ITEM	CATEGORY	NUMBER OF NSW WORKERS	PROPORTION OF WORKERS
Total number of new silicosis cases	N/A	27	100%
Gender of workers	Male	27	100%
Age of workers	<30	1	4%
	31-40	5	19%
	41-50	6	22%
	51-60	6	22%
	61-70	1	4%
	71-80	4	15%
	81-90	4	15%
Country of birth			
	Australia	8	30%
	Europe (incl. Greece, Yugoslavia, Serbia, Croatia)	4	15%
	Asia (incl. Malaysia, China)	3	11%
	Middle East (incl. Afghanistan, Lebanon)	3	11%
	United Kingdom	1	4%
	New Zealand	1	4%

ITEM	CATEGORY	NUMBER OF NSW WORKERS	PROPORTION OF WORKERS
	Not identified	7	26%
Industry			
	Manufactured stone	12	44%
	Tunnelling	6	22%
	Construction/Labourer	2	7%
	Other (incl. clay/brick; plumber; concrete; construction; demolition; quarrying; foundry; metal fabrication)	7	26%
Form of silicosis			
	Chronic	22	81%
	Accelerated	2	7%
	Acute	1	4%
	Not determined	2	7%
Lung impairment (%)			
	0-5%	10	37%
	6-10%	2	7%
	11-15%	3	11%
	16-20%	1	4%
	21-25%	0	-
	26-30%	2	7%
	31-35%	0	-
	36-40%	1	4%
	>40%	4	15%
	Not provided	4	15%

12.1 Basic demographics

All cases diagnosed with silicosis in the first six months of notifications identified as being male. The age of cases ranged between <30 years up to 81-90 years. Most cases (63%) were between the ages of 31 and 60 years, with a relatively even distribution of cases assigned to each age category. Cases aged between 71 and 90 years represented 30% of those diagnosed with silicosis in the first six months of notifications.

Country of birth was identified for 20 cases during the first six months of notifications: 30% of cases were born in Australia, with the remainder were born in Asia (including China and Malaysia), Europe (including Greece, Yugoslavia, Serbia and Croatia, the Middle East (including Afghanistan and Lebanon), the United Kingdom and New Zealand. Country of birth of the remaining seven workers was 'not identified'.

A total of 44% of cases diagnosed with silicosis in the first six months of notifications identified as working in the manufactured stone industry, followed by 22% who identified as working in the tunnelling industry. The remainder of cases were distributed evenly among the construction and other industry categories, including plumbing, concrete, clay/brick, demolition, quarrying, foundry, and metal fabrication.

12.2 Number of silicosis cases, silicosis type and level of lung impairment

A total of 27 new silicosis cases across all industries were reported during the first six months of notifications. Of these 27 new cases, a total of 12 cases (44%) were from the manufactured stone industry. The proportion of manufactured stone workers represented in the total silicosis case numbers is slightly less than the previous three financial years in which 56% of the total number of workers were from the manufactured stone industry.

Of the 27 new silicosis cases across all industries, 22 (81%) were diagnosed with chronic silicosis. The data presented for workers with chronic silicosis do not differentiate between those with chronic simple and chronic complicated types. Accelerated and acute silicosis were observed in 2 (7%) and 1 (4%) worker/s, respectively. It is also noted that the form of silicosis was 'not determined' in 2 workers.

The level of lung impairment was provided for 23 workers. Of these 23 workers, 10 were assigned a lung impairment level of 0-5%, and five were assigned a lung impairment level of between 36% and greater than 40%. The level of lung impairment for the remaining workers (8) ranged between 6% and 30%.

13.0 CONCLUSIONS

The conclusions drawn from this case finding study are provided as a response to each of the four study questions:

- i) What is the incidence and prevalence of silicosis from exposure to respirable crystalline silica in manufactured stone workers?

Based on an estimate of the number of manufactured stone workers in the manufactured stone industry in NSW, the average incidence (i.e. new cases) of silicosis among the manufactured stone industry is estimated to be between 4% and 9% for the three-year reporting period. The values for incidence may also be considered as the estimated prevalence (i.e. current total cases) of silicosis within the manufactured stone industry, and should be treated as a baseline upon which to add future new cases as they arise.

The uncertainties associated with silicosis incidence and prevalence are largely due to the uncertainties regarding the actual number of manufactured stone workers in NSW, as well as the limitations associated with the reliance on compensation data as a single source for new silicosis diagnoses.

- ii) Is the available data representative of manufactured stone workers in NSW?

The available icare NSW data likely represents a good proportion of silicosis cases in the manufactured stone industry in NSW. However, there are likely to be additional cases of silicosis in the manufactured stone industry who are not represented in the current data, due the following key reasons:

- A proportion of manufactured stone workers in NSW may have moved on, or retired, from the industry prior to or since the targeted screening commenced, and therefore have not been captured in the recent health monitoring campaign.
- Manufactured stone stonemasons and installers who do not work specifically in the manufactured stone industry but have been exposed to crystalline silica whilst working in the construction (or similar) industry, have not been the focus of this study, but represent an important cohort with exposure to respirable crystalline silica from manufactured stone products.

With regard to the NSW Health hospital admissions and deaths data, it is not possible to draw any conclusions regarding manufactured stone workers as the occupations of patients have not been reported.

- iii) Is the data comparable to other jurisdictions in Australia and internationally?

The incidence of silicosis among NSW manufactured stone industry workers that were screened during the reporting period (12.6%) is notably lower than the incidence reported in stonemasons in Victoria (29%). In contrast, a South Australian study reported that of the 295 workers who consented to the use of their data, there were 18 cases of probably, possible or confirmed simple silicosis, equating to a comparatively lower incidence of 6.1%. However, given that the methods of collecting and reporting data differ between jurisdictions, any comparisons should be considered with a degree of caution.

- iv) Is additional data able to be collected to benefit of informing key question i)?

Additional data may be collected to continue to inform an accurate understanding of incidence and prevalence of silicosis from exposure to respirable crystalline silica in manufactured stone workers. The information contained in this study may assist with future data collection and future case finding studies and activities.

14.0 LIMITATIONS AND ASSUMPTIONS

14.1 Estimating actual case numbers in NSW

There are several limitations in using icare NSW screening data to estimate the number of cases diagnosed in NSW.

Firstly, not all workers with silicosis will be captured under the icare NSW system. In the absence of any systematic data collection, it is not possible to determine the numbers of silicosis cases diagnosed for those who elect to use a different health monitoring or lung screen service provider.

Secondly, owing to the long latency period associated with silicosis (can be greater than 10 years), and the subsequent difficulties in providing evidence of exposure in NSW that occurred during that time, there are likely fewer compensation settlements than actual cases of silicosis. Nevertheless, the icare NSW annual report for 2019-20 (icare NSW, 2020) indicates that silicosis compensation costs increased during the reporting period, likely due to increased screening efforts. Another factor could be the much higher level of public awareness of the causes and effects of silicosis that has arisen from intense media attention to the issue over the last few years. It is likely that this would have led to an increased number of people coming forward for a health check.

Compensation data therefore provides a useful, but not complete, indicator of the occurrence of silicosis in the NSW workforce, or among industry sectors. It is possible that many workers who suffer illness years after exposure has ceased do not seek compensation (AIOH, 2018).

14.2 Data linkages and case triangulation

One of the key limitations of this study were the challenges associated with integrating and linking the disparate case data collected by the three NSW agencies. Therefore, triangulation of case data has not been possible.

14.3 Data verification

This study has not had the opportunity to verify the data received from icare NSW, NSW Health, or SafeWork NSW against the original records, files. This study also has not had any engagement with cases of silicosis or the manufactured stone industry.

14.4 Diagnostic limitations

Until quite recently silicosis has not been the public eye. Preventable dust diseases were thought to be a 'thing of the past', particularly since work health safety practices have improved due to awareness of potential health impacts from dust and fibres, such as asbestos. Hence, silicosis may have not been at the forefront of awareness among physicians. Likewise, the physicians training curriculum may have had only a low consideration of silicosis with a traditionally long latency, and possibly no consideration of acute or accelerated silicosis. Hence, physicians may have then not followed a line of enquiry regarding specific occupational exposure scenarios nor know what questions to ask when a case of respiratory illness first presents. If this is the case, this may be a limitation of the first-time hospitalisation data which may be bias towards under-reporting.

15.0 IMPORTANT INFORMATION ABOUT THIS REPORT

Your attention is drawn to the document titled - "Important Information Relating to this Report", which is included in Appendix C of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

16.0 REFERENCES

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Signature Page

Golder Associates Pty Ltd



Matthew James
Principal Environmental Scientist



Mike Woods
Principal Environment, Health and Safety Consultant

MJ,RM/SM,MW/cl

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APPENDIX A

Third party review endorsement

Letter of Endorsement

SafeWork NSW commissioned this case finding study to investigate respirable crystalline silica (RCS) exposure in the manufactured stone industry, and to gather information to improve the identification and assessment of workers at risk of exposure.

The Department has requested that this report will be independently prepared and peer reviewed to meet Section 276A of the Work Health and Safety Amendment (Information Exchange) Act 2020 No 34.

I was approached to provide an independent review of the Golder report. I confirm that I am an Occupational Hygienist, experienced in the anticipation, recognition, evaluation and control aspects of managing respirable crystalline silica in a workplace setting.

Key questions for this study were:

- i. What is the incidence and prevalence of silicosis from exposure to RCS in manufactured stone workers?
- ii. Is the available data representative of manufactured stone workers in NSW?
- iii. Is the data comparable to other jurisdictions in Australia and internationally?
- iv. Is additional data able to be collected to benefit informing the first question?

I have reviewed the draft report and confirm that:

- i. The terms of reference of the exercise have been met.
- ii. The report is scientifically valid.
- iii. The methodology employed by the authors is fit for purpose.
- iv. The conclusions drawn have merit.

The authors have attempted a triangulation exercise to pull together quite disparate statistics from three key government agencies (NSW Health, icare and SafeWork NSW). The report reads well, has a good array of charts and tables to summarise the data, and addresses the key questions mentioned above.

The problems in matching data from the agencies that cover health, workers compensation and WHS is a common and shared experience with the other Australian States and Territories. All jurisdictions have been active in responding to the re-emergence of silicosis in the last few years, in particular with outcomes from the manufactured stone industry. All are grappling with how to draw agency data together in some meaningful way. Similar issues are being encountered.

Thank you for the opportunity to be part of the process.



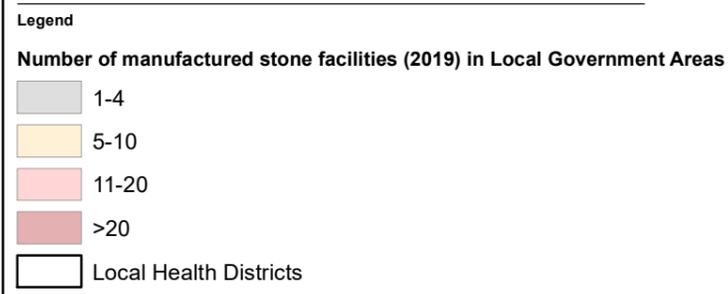
**Dr Barry Chesson AM, PhD, BSc (Hons), GradDipNatRes, MAppSc (Health Science), FAIOH,
COH, CIH, (1985-2017), FRACI, CChem**

**Adjunct Associate Professor, Edith Cowan University
Former President, Australian Institute of Occupational Hygienists**

Reviewer

APPENDIX B

Figures



FOR DISCUSSION PURPOSES ONLY
DRAFT

0 1,000 2,000
Kilometers
1:4,500,000 @ A3 METRES

Coordinate System: GCS GDA 1994
Datum: GDA 1994

CLIENT	DD-MM-YYYY	4/22/2021
SAFEWORK NSW	DESIGNED	GOLDER
	PREPARED	KAF
	REVIEWED	MJ
	APPROVED	

GOLDER

NOTE(S)

REFERENCE(S)
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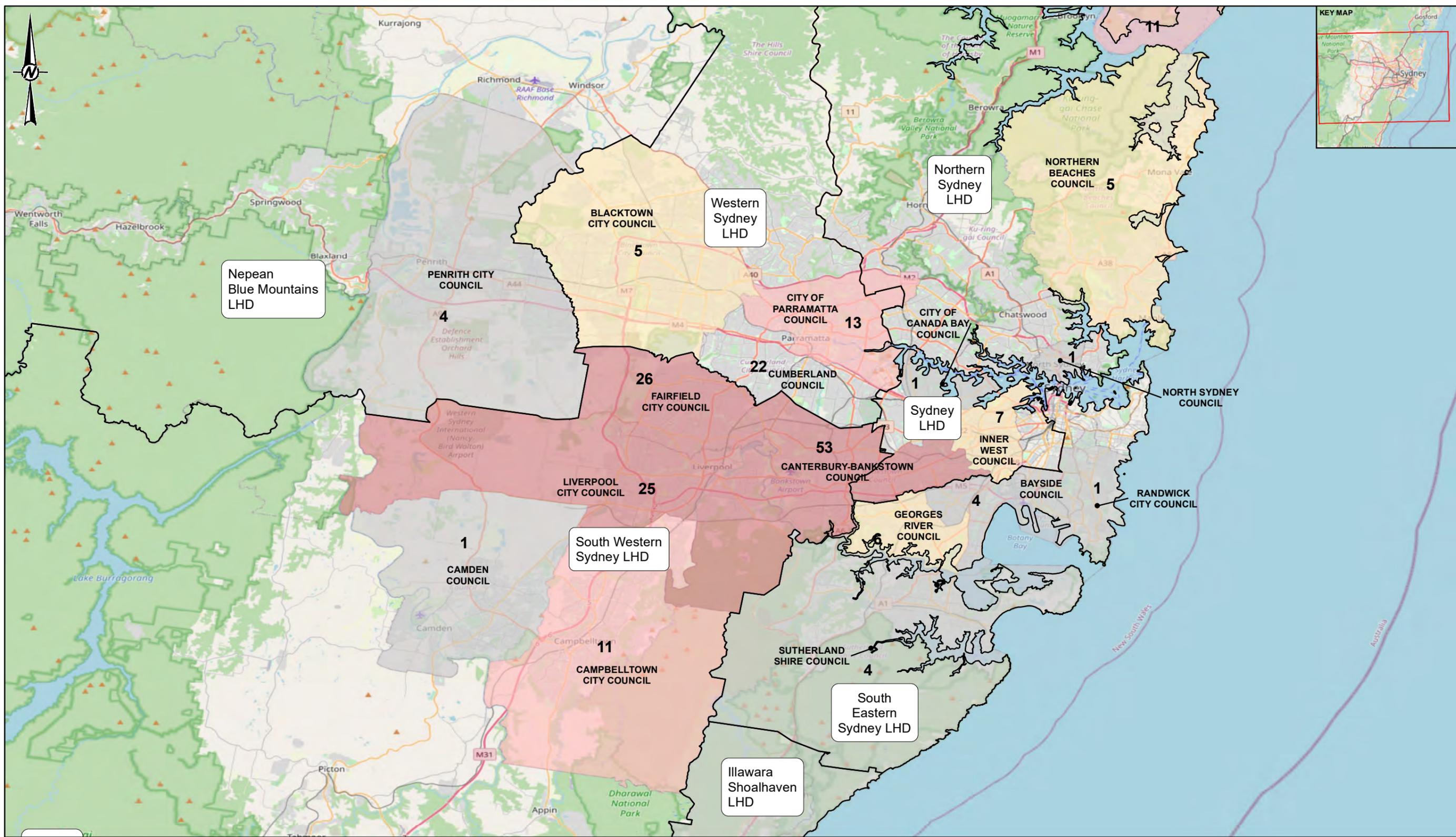
PROJECT
CASE FINDING STUDY - RESPIRABLE CRYSTALLINE SILICA EXPOSURE IN THE MANUFACTURED STONE INDUSTRY

TITLE
MANUFACTURED STONE FACILITY LOCATIONS

PROJECT NO.	CONTROL	REV.	FIGURE
20447198		A	1

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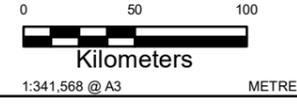
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN ADJUSTED FROM 150 X 25mm



Legend
Number of manufactured stone facilities (2019) in Local Government Areas

- 1-4
- 5-10
- 11-20
- >20
- Local Health District

FOR DISCUSSION PURPOSES ONLY
DRAFT



Coordinate System: GCS GDA 1994
 Datum: GDA 1994

CLIENT
 SAFEWORK NSW

CONSULTANT	DD-MM-YYYY	4/22/2021
	DESIGNED	GOLDER
	PREPARED	KAF
	REVIEWED	MJ
	APPROVED	



NOTE(S)
 REFERENCE(S)
 Background map copyright of Open Street Map

PROJECT
 CASE FINDING STUDY - RESPIRABLE CRYSTALLINE SILICA EXPOSURE IN THE MANUFACTURED STONE INDUSTRY

TITLE
MANUFACTURED STONE FACILITY LOCATIONS

PROJECT NO. 20442120 CONTROL REV. A FIGURE 2

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APPENDIX C

**Important Information about this
Report**

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Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

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Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder's affiliated companies or the employees, officers or directors of any of them.

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Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification



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