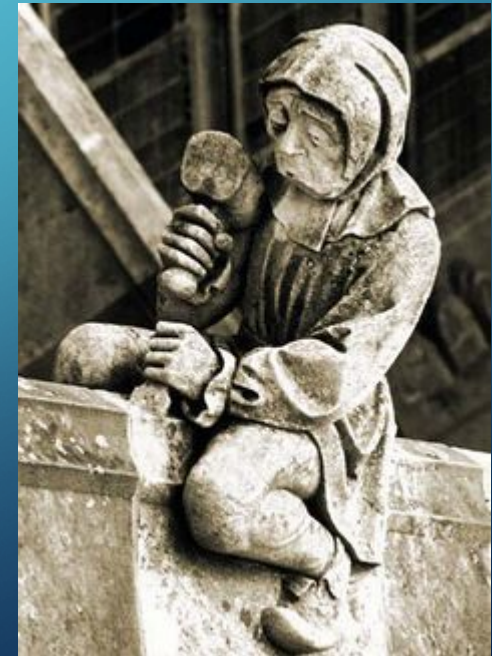


ENGINEERED STONE: WHY A BAN IS THE ONLY ANSWER

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OUTLINE OF THIS TALK

- Silica
- What is silicosis
- Accelerated silicosis - re-emergence of an old disease
- Engineered stone
- Difficulties controlling exposure – why a ban is the only answer
- Asbestos as an example
- Questions

RESPIRABLE CRYSTALLINE SILICA

- Silica is silicon dioxide – one of the most abundant minerals in the earth's crust.
- Present in almost all types of rock, sand, clays, shale and gravel
 - Bricks, tiles and concrete
- Two forms – crystalline and non crystalline
- Crystalline silica - quartz, cristobalite, tridimite
- Crystalline form broken down into very small parts (grinding, sanding, blasting, cutting etc)
- Respirable – small dust particles $< 10\mu\text{m}$ in diameter – can penetrate to the extremities of the lung

NO EVIDENCE OF A SAFE LEVEL OF SILICA EXPOSURE

- “... It cannot be assumed that there is a threshold (i.e., tolerable concentration) at which exposure to silica would not result in silicosis and/or lung cancer.”*
- An analysis of pooled results from 10 studies of silica exposed workers found 20.7 fewer deaths per 1000 workers by aged 80 if exposure to silica was eliminated.**

*International Program on Chemical Safety[^]. Concise International Chemical Assessment Document 24.

Crystalline silica, quartz. 2000. (^A joint venture of the World Health Organisation, United Nations Environment Program and the International Labour Organisation)

** Keil A, et al. 2018. Estimating the impact of changes to occupational standards for silica exposure on lung cancer mortality. *Epidemiology*; 658-665

SILICOSIS

- Caused by inhalation of crystalline silica
- Formation of scar tissue or fibrosing within the lung
- Shortness of breath, chest pain
- Chronic respiratory disease
- Progressive
- Progressive Massive Fibrosis- the most advanced form
- No treatment – lung transplant
- PREVENTABLE

HISTORY OF SILICOSIS

- Bernardino Ramazzini 1713
- Industrialisation - ↑ cases
- Mechanisation of mining - ↑ cases
- Hawk's Nest Tunnel disaster
 - 100th Anniversary



Monument at the Hawk's Nest Workers Memorial Cemetery



HISTORY OF SILICOSIS – AUSTRALIAN EXPERIENCE

- 1870 introduction of the pneumatic drill
- Silicosis – big problem for metal miners (miners phthisis)
- Series of Inquiries and Royal Commissions –
 - 1902,
 - 1904/5,
 - 1910/11,
 - 1914
- 1910 study of 1805 Kalgoorlie goldminers
 - 19.6% early fibrosis
 - 2% intermediate fibrosis
 - 0.2% advanced fibrosis
 - 1.5% tuberculosis

HISTORY OF SILICOSIS

- 1930 Conference – South Africa – international agreement on etiology
- 1995 International Labour Organisation and World Health Organisation called for elimination of silicosis – stating that both knowledge and means to do it were within our reach - (25 years ago)

NOT JUST SILICOSIS

- Exposure to respirable crystalline silica also causes
- Autoimmune diseases*
 - Scleroderma
 - Rheumatoid arthritis
- Kidney disease***
- Lung and kidney cancer**
- Chronic obstructive pulmonary disease****

*C Parks et al, 1999 Occupational Exposure to Crystalline Silica and Autoimmune Disease. Environmental Health Perspectives, vol 107 (supp 5).

** International Agency for Research in Cancer (IARC), 2012. Silica dust, crystalline, in the form of quartz or cristobalite.

*** S Vupputuri et al. 2011. Occupational silica exposure and chronic kidney disease. Renal Failure;34(1):40-46

****E Hnizdo 2003. Chronic obstructive pulmonary disease due to occupational exposure to silica dust: a review of epidemiological and pathological evidence. Occupational and Environmental Medicine 40(\$):237-43

NEW CASES OF AN OLD DISEASE - ACCELERATED SILICOSIS

- Progressive – progressive massive fibrosis (PMF)
- Young workers
- Ethnic minority workers
- Average duration of exposure (2 – 20+ years)*
- Disease remains seriously progressive after cessation of exposure
- Lung transplant

- PREVENTABLE

*C Rose et al. Severe silicosis in engineered stone fabrication workers – California, Colorado, Texas and Washington, 2017-19. Morbidity and Mortality Weekly Report, vol 68(38). 2019. Centers for Disease Control and Prevention

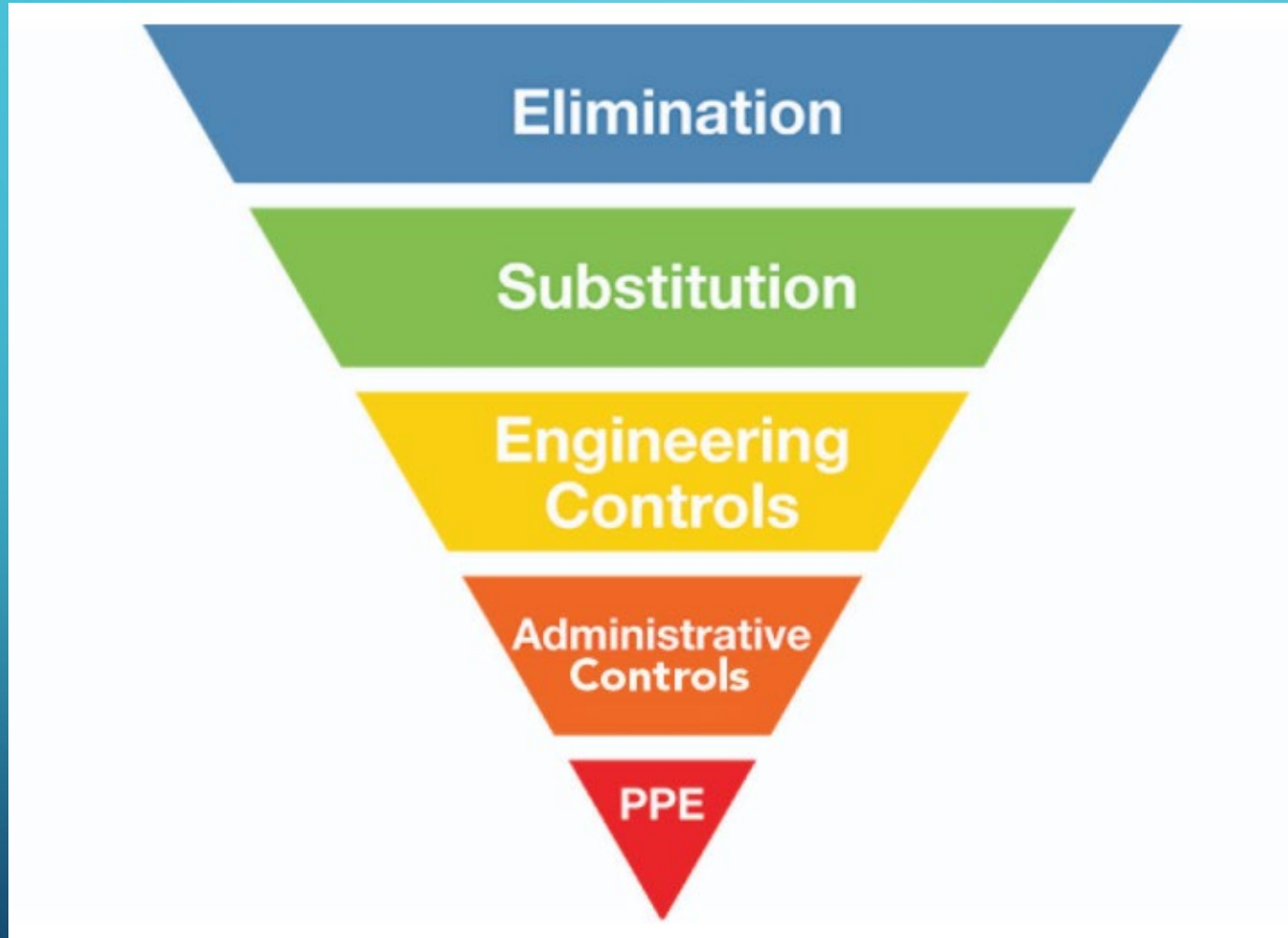
NEW CASES OF AN OLD DISEASE - ACCELERATED SILICOSIS

- 106 patients followed up for 4 years in Spain*
- Average age at diagnosis 36 years \pm 7 years
- Average duration of exposure 12 years \pm 4.3 years
- Latency period 13.7 years \pm 4.1 years
 - 28 patients developed disease between 5 and 10 years since first exposure
- ALL PATIENTS CEASED EXPOSURE AT OR BEFORE DIAGNOSIS
- During the four years of the study;
 - > 50% showed progression of silicosis
 - 1/3 diagnosed with simple silicosis – progressed to progressive massive fibrosis
 - Léon-Jiménez, A et al. 2020. Artificial stone silicosis, rapid progression following exposure cessation.
 - CHEST; DOI:<https://doi.org/10.1016/j.chest.2020.03.026>

NUMBER OF NEW SILICOSIS CASES - MIDYEAR 2020 (AUSTRALIA)

- \approx 400 cases – most from Queensland
- Information comes from regulator or compensation statistics
- Average age 44 years
- Other diseases not reported on

HIERARCHY OF CONTROL



ENGINEERING CONTROLS

Engineering Controls



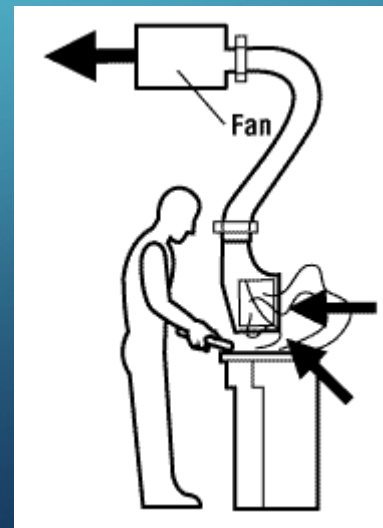
Engineering Controls

Grinding without engineering controls



Grinding using a vacuum dust collector

OSHA



ADMINISTRATIVE CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT (PPE)



NEW CASES OF AN OLD DISEASE - WHY?

- Engineered Stone
 - A manufactured composite stone material that contains resins and has a crystalline silica content of 80 per cent or greater (Victorian Occupational Health and Safety Amendment (Crystalline Silica) Regulations 2019).
- Much higher silica content than natural stone 95% v 10-45% in granite
- Fabrication processes with power tools produce high levels of silica dust
 - > 300 times the occupational standard.
- Used for stone benchtops in kitchens and bathrooms



RA Cohen. Artificial Stone Silicosis. Removal from exposure is not enough. 2019. Chest.
DOI:
<https://doi.org/10.1016/j.chest.2019.11.029>

NEW CASES OF AN OLD DISEASE - WHY?

- High levels of silica might not be the only problem
- Particles generated from the process contain toxic pigments – iron, copper, zinc, potassium, titanium and others
- High % of ultrafine particles (<0.1 μm in diameter)
 - Very large reactive surface areas
 - Concentration in sputum correlates negatively with lung function
 - Concentration in sputum correlates positively with severity of CT Scan abnormalities.

RA Cohen. Artificial Stone Silicosis. Removal from exposure is not enough. 2019. Chest.
DOI: <https://doi.org/10.1016/j.chest.2019.11.029>

EXPOSURE DIFFICULT TO CONTROL



- Dry cutting
- Study from the UK showed that 61% of RCS exposures where water suppression was present exceeded the RCS Workplace Exposure Limit*
- High levels of exposure reported even when wet cutting (0.69 mg/m^3) – standard is 0.05 mg/m^3 **

* PEJ Baldwin et al, Exposure to RCS in the GB brick manufacturing and stone working industries. *Annals of Work Exposures and Health*, 2019, Vol.63, No. 2, 184-196

**Office of Industrial Relations Workplace Health and Safety Queensland. Findings report: phase one audits of engineered stone benchtop fabricators in South East Queensland. 2019

EXPOSURE DIFFICULT TO CONTROL

- Industry consists of small and medium sized enterprises (SMEs)
 - Least likely to comply with OH&S procedures
- WA Worksafe's auditing the industry
 - Proactive campaign since July 2018 – to control silica in Engineered Stone Industry
- 100 Workplace Inspections
- 840 Improvement notices issued (most directly related to exposure control and health surveillance)
- 11 Prohibition notices issued
 - The Inspector does not leave the premises until this process/activity is stopped!
- Conducted a number of silica information sessions over the course of the campaign

SO WHAT IS BEING DONE TO REDUCE DISEASE RISK?

- Introduction of reduced exposure standard to $0.05\text{mg}/\text{m}^3$ (eight hour time-weighted average)
- Industry Audit(s)
- Air monitoring in some sites
- Information sessions
- Guidance notes
- Translation of documents – Hindi, Arabic, Simplified Chinese, Vietnamese
- Health Surveillance/Monitoring
- Disease registry



SO WHAT IS BEING DONE TO REDUCE DISEASE RISK?

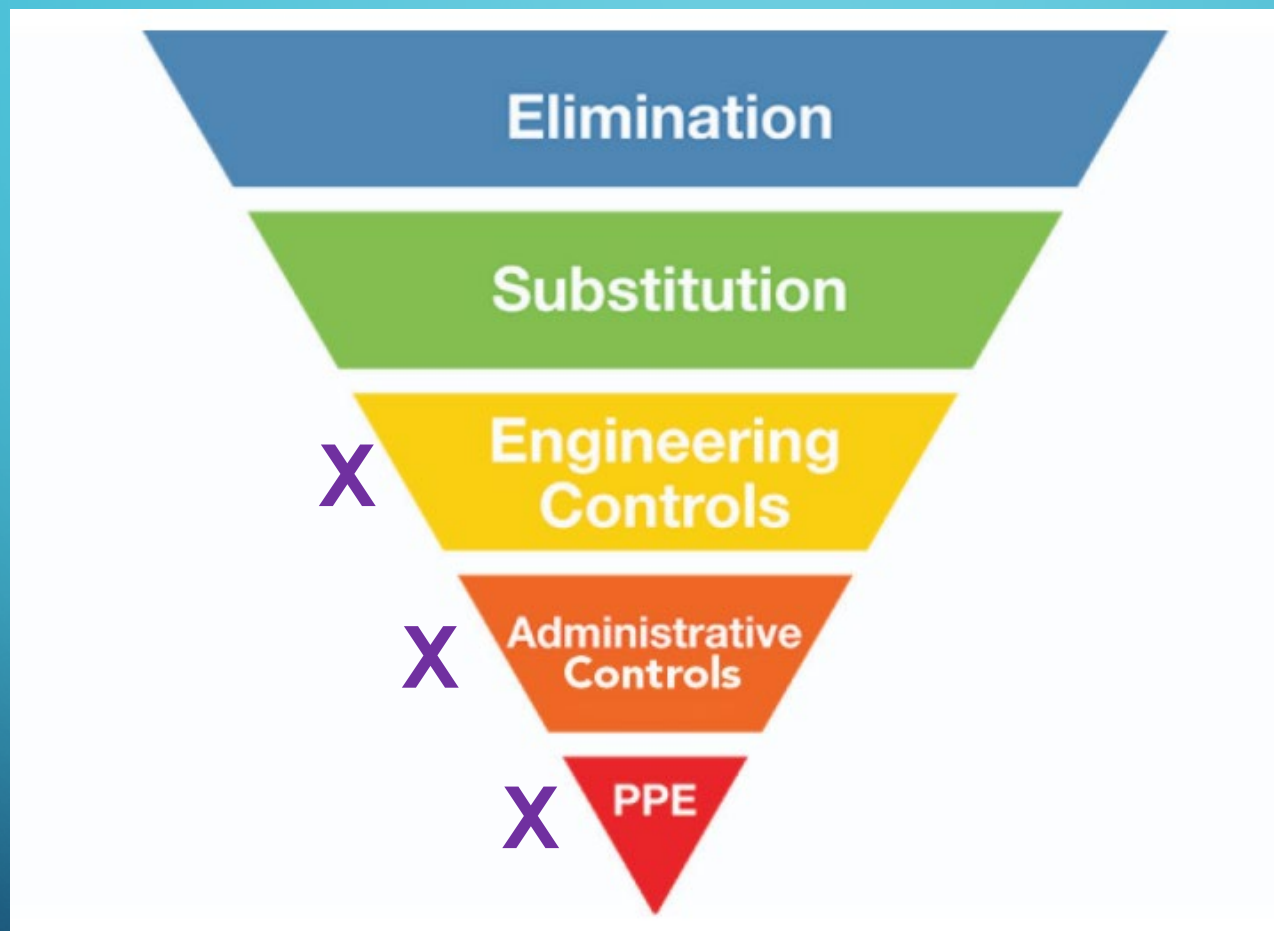
- From 1/7/2020 – NSW introduced an amendment to WHS Regulation
 - Power tool use to dry cut engineered stone only if:
 - Worker using ‘effective’ RPE* – comply with AS/NZS 11716-2012
 - AND at least one of three additional controls;
 - Water delivery system; tool-attached extraction system; local exhaust ventilation system
 - On-the-spot fines will be issued for uncontrolled dry-cutting of engineered stone
- 2020 - Victoria introduced a licensing scheme for engineered stone
 - Only licensees will be supplied engineered stone

*RPE – Respiratory Protective Equipment

SO WHAT IS BEING DONE TO REDUCE DISEASE RISK?

- While all of these activities are welcome, they still permit workers to work with a known dangerous carcinogen using methods that have been demonstrated to be unreliable in settings where worker health and safety is not always a priority.

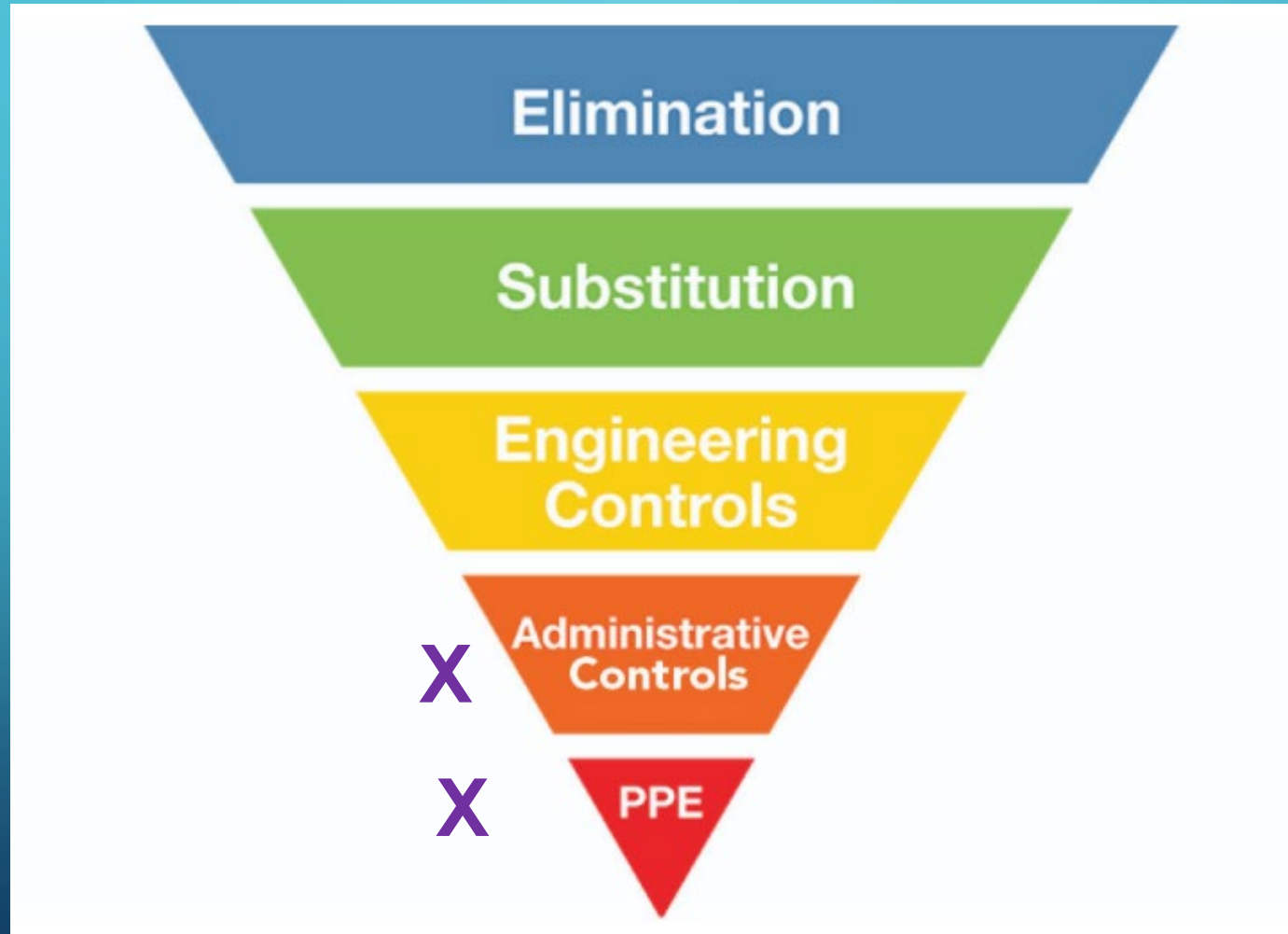
HIERARCHY OF CONTROL



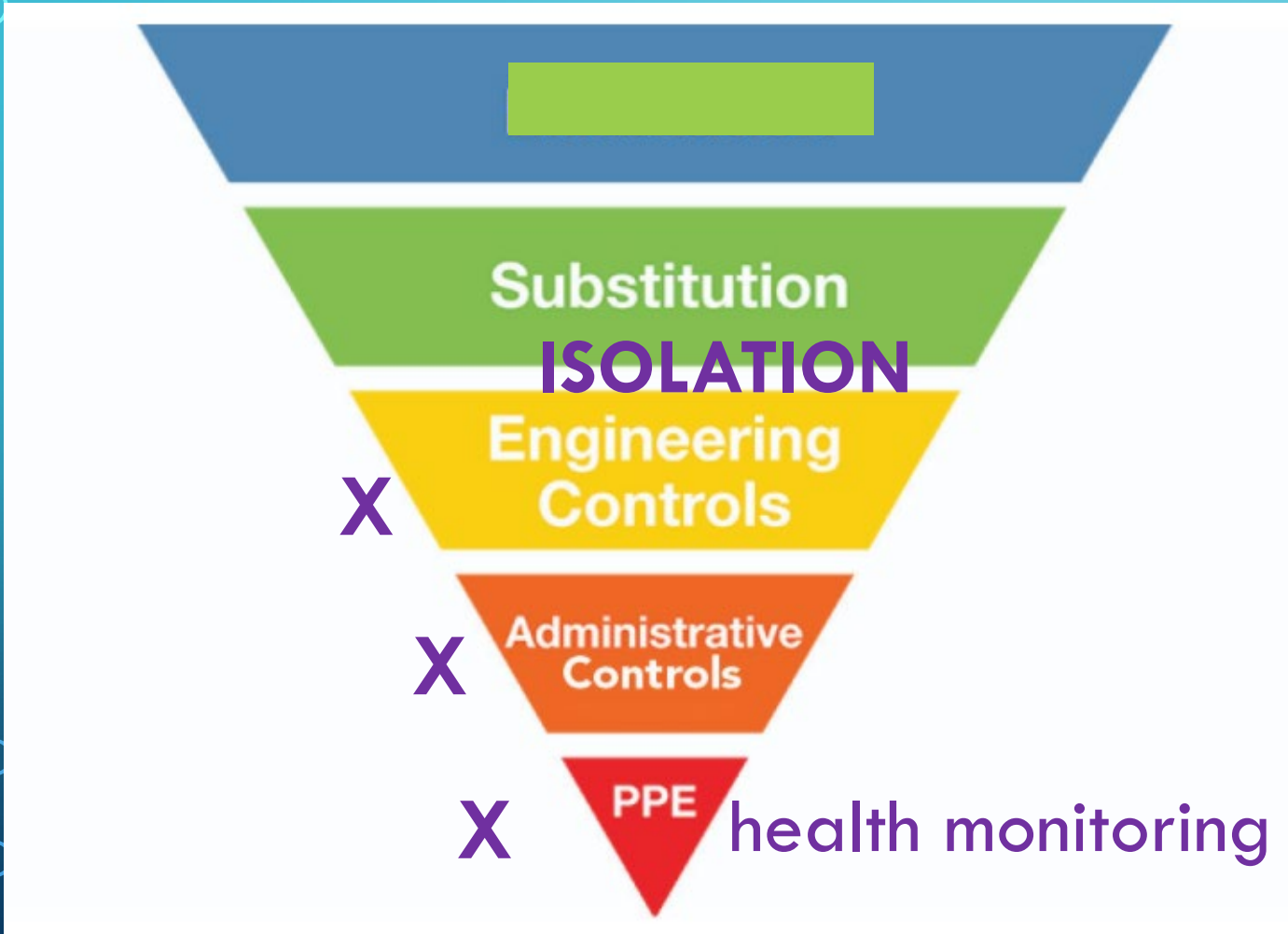
NATIONAL DUST DISEASE TASKFORCE INTERIM RECOMMENDATIONS (DEC 2019)

- 1. Develop and implement a prevention strategy with an immediate targeted education and communication campaign
- 2. Develop a national approach to understand the extent of occupational dust diseases in Australia through identification and capture of data, information collection and sharing....
- 3. Apply a strategic approach to research to better understand accelerated silicosis with the ultimate aim of improving prevention and treatment options. This includes establishing a research collaboration platform across Australia to ensure resources are targeted, activities address research gaps and efforts are not duplicated.
- 4. Develop national guidance on an approach to actively search for people at risk from respirable crystalline silica dust exposure at the workplace
- 5. Develop a strategic national approach to improve Australia's ability to detect and rapidly respond to any future emerging occupational diseases of significance.

NATIONAL TASKFORCE RECOMMENDING.....



SAFEWORK AUSTRALIA RECOMMENDING.....



THERE ARE ALTERNATIVES WITH LOWER SILICA CONTENT

- Natural stone
- Granite
- Betta stone

- Good for Australian economy – locally manufactured products

WHY ENGINEERED STONE SHOULD BE BANNED

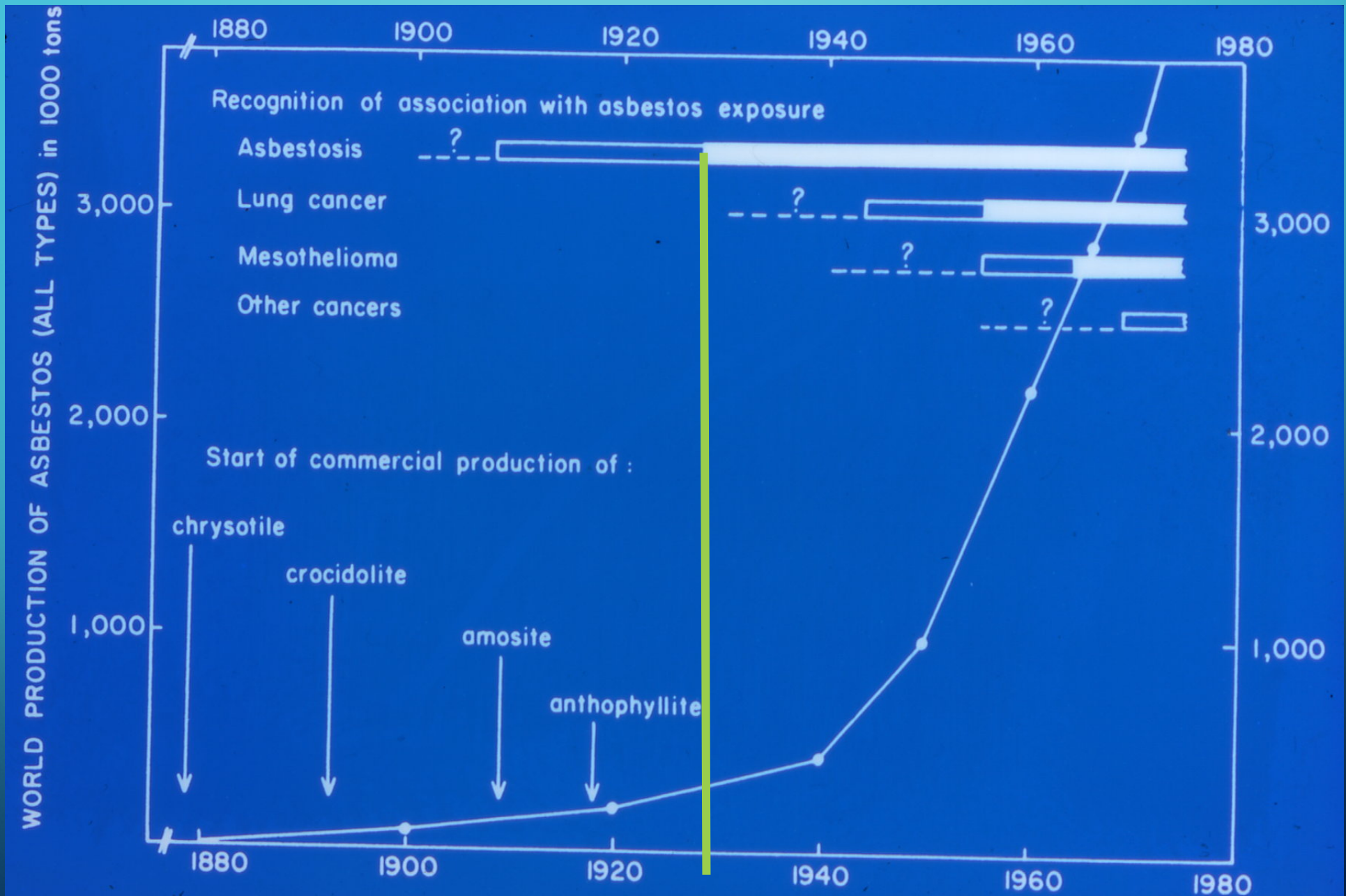
- Difficult to control the exposure
- Exposure causes disease
- Long term risk of exposure (eg future renovation of bathrooms and kitchens)
 - Possibility of non-occupational exposure
- There are alternatives with lower silica content
- Engineered stone is not manufactured in Australia
- SILICA-RELATED DISEASES ARE PREVENTABLE

ASBESTOS – A BAD EXAMPLE OF CONTROLLING EXPOSURE

- We have been here before!
- Aimed to control exposure rather than eliminate it
 - High rates of unnecessary morbidity and mortality
 - Ongoing contamination
- Asbestos-related diseases
 - Asbestosis – progressive incurable fibrosing of the lungs
 - Lung cancer
 - Malignant mesothelioma – cancer only caused by asbestos exposure

PARALLELS WITH ASBESTOS

- Asbestos mining, manufacturing and importation in Australia commenced in 1880s
- Amazing mineral – heat/cold/chemical resistant properties
- Major industry – peaked post WWII
- > 3000 products
- 1950s Australia was largest user and consumer of asbestos globally (per capita)
- Every capital city had an asbestos cement factory
- Widespread (and long term) distribution throughout the community – residential, commercial and government buildings.



Slide from M Becklake.

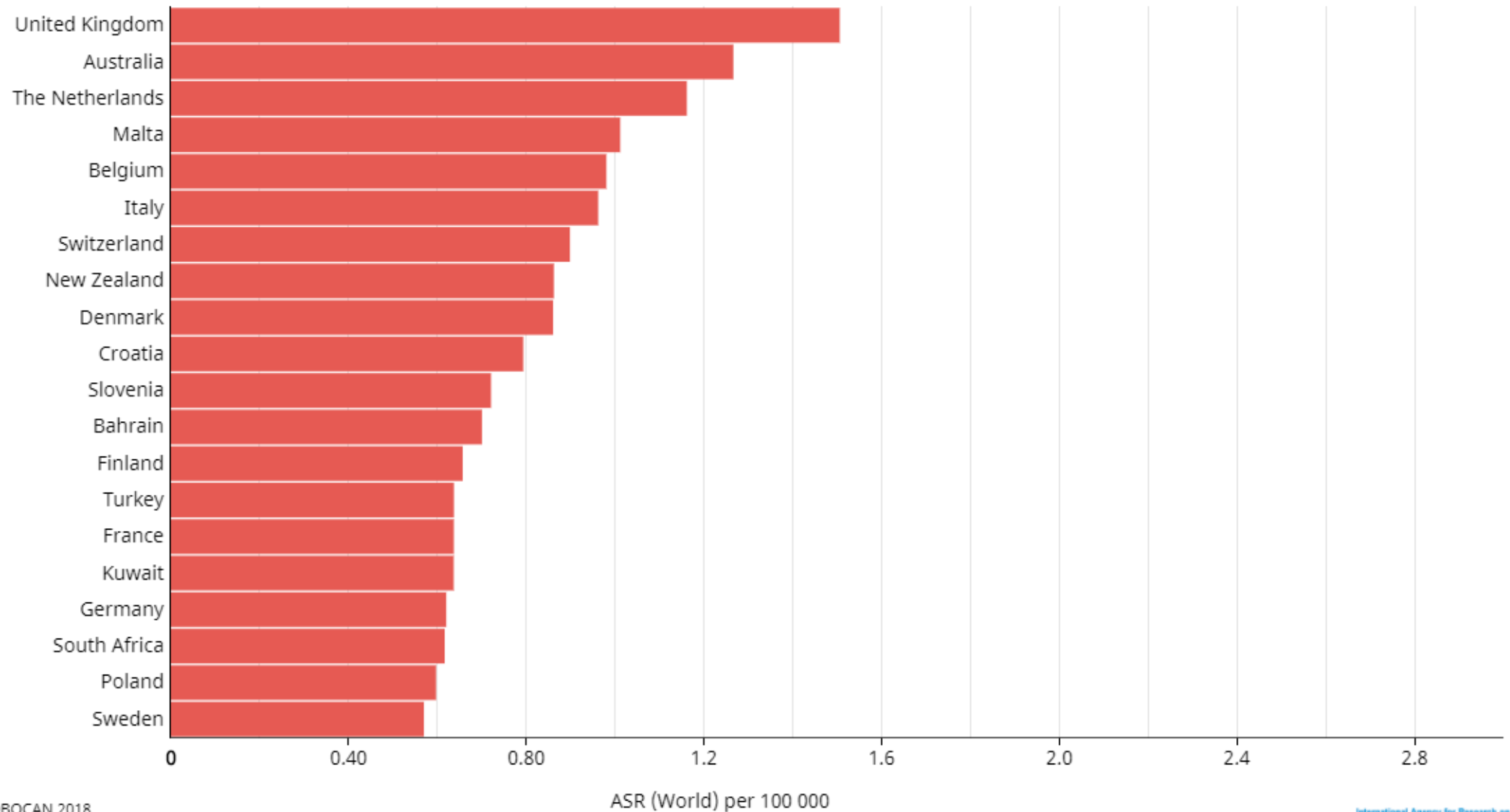
AUSTRALIA'S ATTEMPTS AT CONTROLLING EXPOSURE

- From 1960s a series of reducing exposure standards were introduced – controlling dust levels was thought to be the best method of management
- Continued use because NO ALTERNATIVES
- No safe level of exposure (no threshold)
- Blue and brown asbestos from the mid 1980s, all new asbestos use banned in 2003 (43 years after we knew it caused mesothelioma, 75 years asbestosis)
- Current occupational exposure standard - 0.1 f/mL TWA

SO HOW DID WE DO?

- To date – estimated 18000 cases of mesothelioma, 108,000 cases of lung cancer, and substantial, but unknown, number of cases of asbestosis
- Australia has one of the highest rates of asbestos-related diseases globally
- Exposure to workforce and community still occurring because of widespread use
- **MORE CASES EXPECTED**

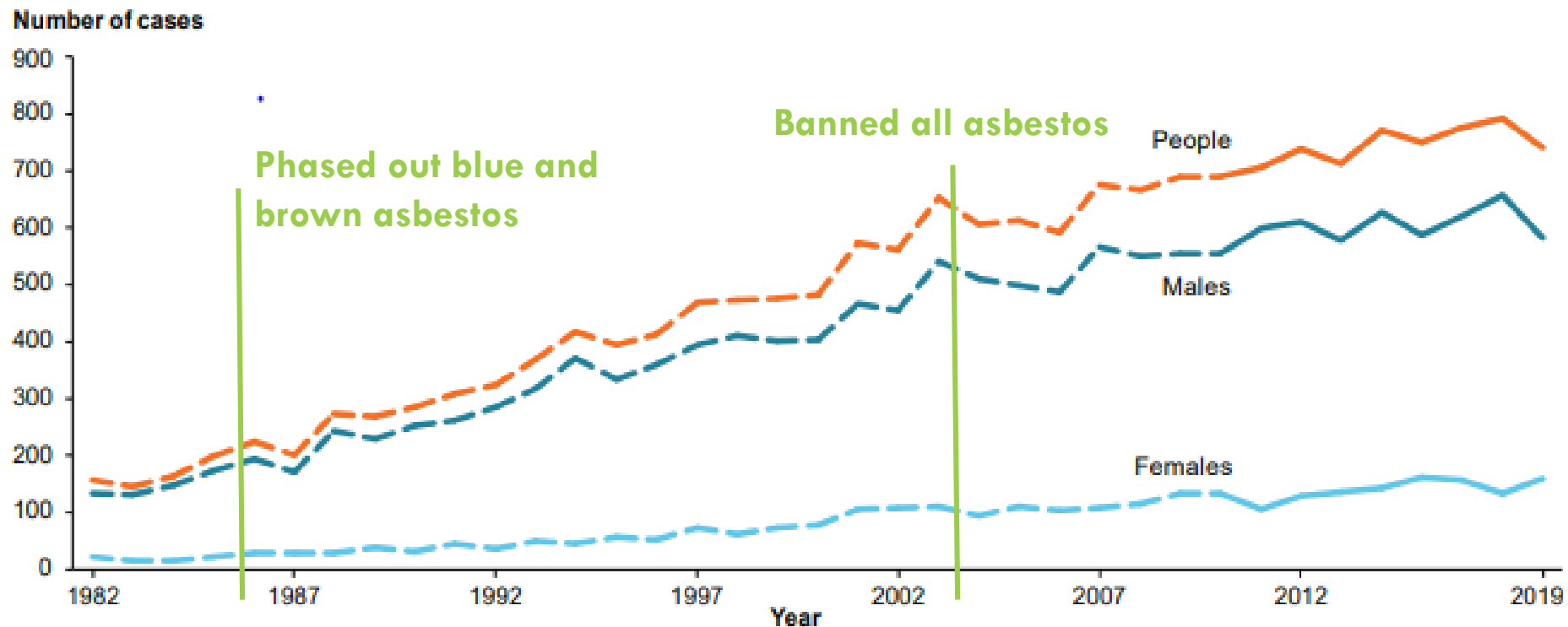
Estimated age-standardized mortality rates (World) in 2018, mesothelioma, both sexes, all ages



Data source: GLOBOCAN 2018
Graph production: Global Cancer Observatory (<http://gco.iarc.fr/>)
© International Agency for Research on Cancer 2020

MESOTHELIOMA AUSTRALIA, 1982-2019

Figure 3: Number of people diagnosed with mesothelioma, by year and sex, 1982 to 2019



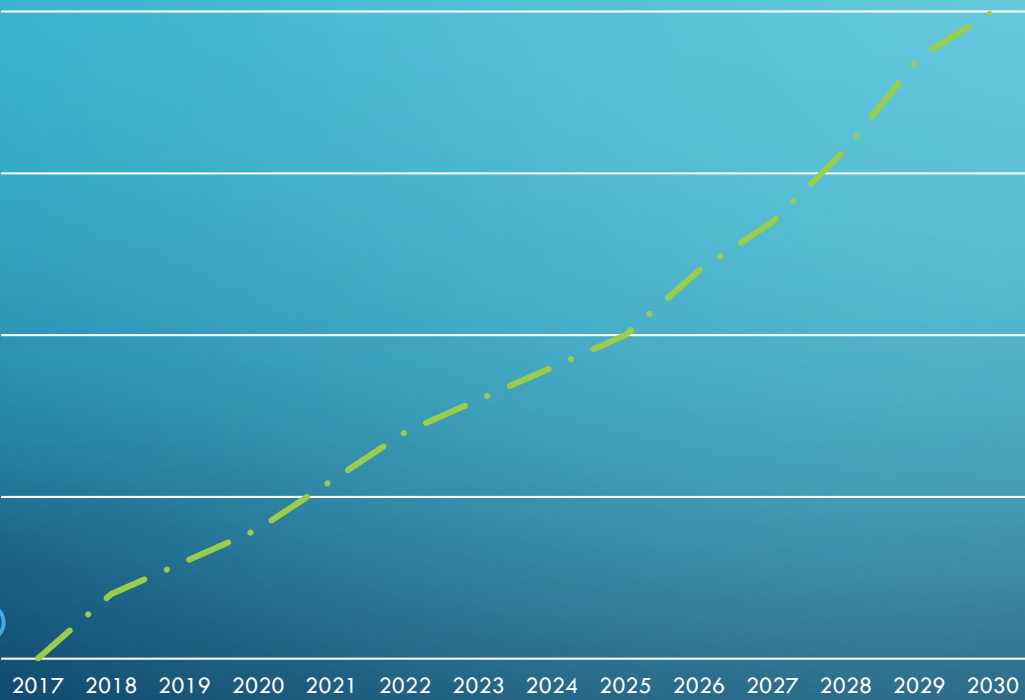
Sources: 1982-2010 (dotted line): AIHW 2018a; 2011-2019 (solid line): AIHW analysis of AMR data at 1 April 2020; Table A3 in *Mesothelioma in Australia 2019—data tables*.

1962-2020, 58 years of mesothelioma cases in Australia

TWO POSSIBLE SCENARIOS OF CASES OF SILICOSIS IN ENGINEERED STONE WORKERS

Number of cases

No Elimination

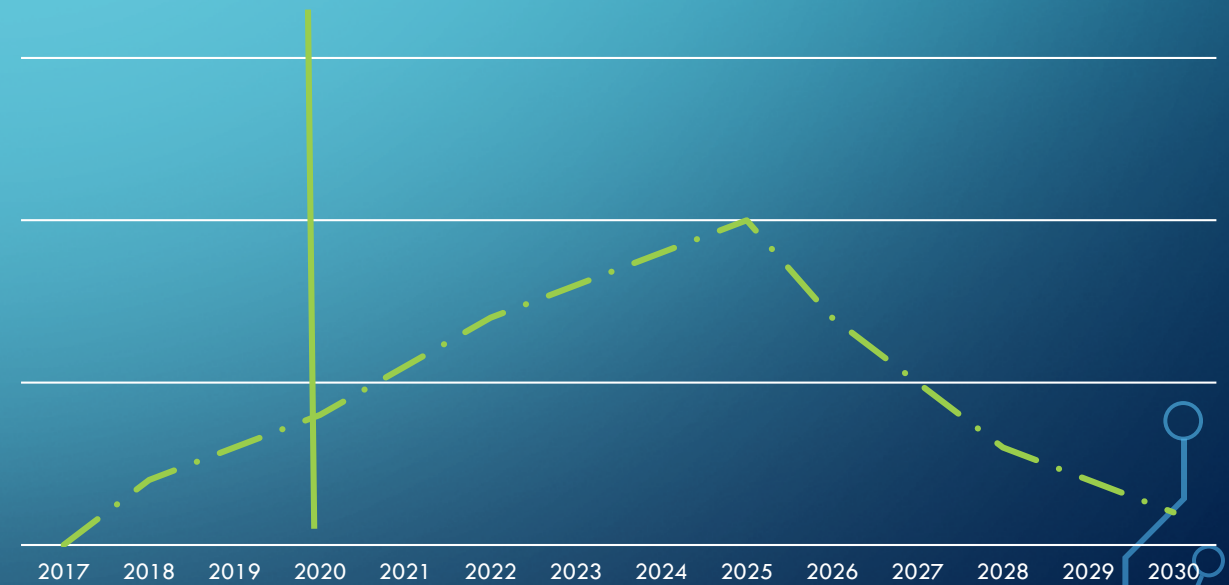


Number of cases

Elimination

Eliminate ES 2020

Peak cases 3-5 years post elimination



WHY WE SHOULD BAN ENGINEERED STONE

- KNOWN cause of PREVENTABLE disease
- Incurable disease with limited treatment options
- Dust is difficult to control (requiring multiple lower level controls)
- Work conducted in SMEs with poor history of hazard control
- There are local (safer) product alternatives
- Not manufactured in Australia - so no industry loss
- LET'S LEARN FROM OUR ASBESTOS EXPERIENCE RATHER THAN REPEAT IT!

The image features a blue gradient background with white circuit-like lines in the corners. These lines consist of straight segments connected by small circles, resembling a network or data flow diagram. The lines are most prominent in the top-left and bottom-left corners, with some extending into the top-right and bottom-right corners.

QUESTIONS?