Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Materials and Methods: Personal breathing zone sampling for respirable dust was conducted on workers during routine wet fabrication activities with handheld tools, such as polishing, grinding, drilling, and cutting, with and without the use of a crossdraft-type mobile particulate capture booth.

Results: In task-specific sampling, use of the mobile particulate capture booth was found to reduce mean RCS exposure by about 50% (p=0.059) during a wet polishing task and significantly reduced the variance of RCS. During full-shift or partial-shift sampling, when exposure was averaged over multiple wet finishing tasks and ancillary activities, use of the booth resulted in smaller, nonsignificant reductions in the central tendency of the respirable dust exposure and significant reduction in the variance. Time-weighted average RCS exposures ranged from <4-85 μg/m3 with the booth off and <5-37 μg/m3 with the booth on.

Conclusions: Use of a particulate capture booth as an adjuvant to wet methods may further control exposure to stone dust during countertop fabrication by constraining the variability of exposures and possibly reducing the central tendency of the exposure distribution.

Special Session 12 Mining occupational safety and health

Chair: Erik Jors and Jinky Leilanie Lu

Session introduction
This session discusses a broad array of research and advocacy issues on occupational safety and health in mining. We will hear from various country-experiences on mining hazards, health and safety risks, interventions, programs, and policy statements.

Sp12-1
ZIMGOBIO - Biomonitoring and Health Data from two ASGM areas in Zimbabwe

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Background: ASGM is an important economic driver in Zimbabwe, especially during the ongoing severe economic crisis of the country. Gold mining is an important source of income for a growing part of the population.

Methods: A cross-sectional study was conducted in two ASGM areas in Zimbabwe. 207 participants were recruited in Kadoma and Shurugwi. All participants were asked to fill out a questionnaire. Health-related quality of life (EQ-5D + C) was assessed with a questionnaire. To assess the exposure to mercury and other toxic metals, blood and urine samples were collected, shipped to Germany and analysed in our laboratory.

Results: The participants Hg levels were elevated compared to people not involved in ASGM. Furthermore, we were able to identify exposure risk factors that have a significant impact on Hg levels. Distribution of mercury in different blood components was significantly affected by time and intensity of exposure. In addition to mercury, arsenic, cadmium and lead levels were elevated in a significant part of the participants, possibly due to mining-related activities that result in the liberation of these metals from the soil. Quality of life was negatively affected by mercury exposure.

Conclusion: From a public health perspective, working conditions must be improved in order to reduce exposure to mercury and toxic metals.

Sp12-2
Tuberculosis and silicosis burden in artisanal and small-scale gold miners in a large occupational health outreach programme in Zimbabwe

Dingani Moyo, Philip Landrigan, Johanna Elbel, Gunnar Nordberg, Roberto Lucchini, Casey Bartrem, Philippe Grandjean, Donna Mergler, Dingani Moyo, Benoit Nemery, Margrit von Braun and Dennis Nowak, and the Collegium Ramazzini

University of the Witwatersrand Midlands State University, Zimbabwe, Africa

Introduction: Artisanal and small-scale miners (ASMs) labor under archaic working conditions and are exposed to high levels of silica dust. Exposure to silica dust has been associated with an increased risk of tuberculosis and silicosis. ASMs are highly mobile and operate in remote areas with near absent access to health services. The main purpose of the study was to evaluate the prevalence of tuberculosis, silicosis and silico-tuberculosis among ASMs.

Method: We conducted a cross-sectional retrospective review of 514 occupational health records of ASMs who were screened for TB and silicosis in the Midlands and Matabeleland South provinces.

Results: The mean age was 37 years and almost all ASMs were exposed to silica dust (95%), and just above a quarter (27%) had a duration of employment of at least 10 years. Fifty-two (11.2%) of the 464 miners were diagnosed with silicosis while 17(4%) of the 422 ASMs were diagnosed with TB. Of the 383 ASMs who were tested for HIV, 90 (23.5%) were HIV positive. HIV infection was associated with a diagnosis of silicosis.

Conclusion: The prevalence of TB and silicosis is very high in Zimbabwe. Targeted screening for silicosis and TB in ASMs and reduction of silica dust exposures are urgently needed.

Sp12-3
Business Continuity amidst COVID-19 Pandemic, Experience on Mining Sector in Indonesia

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Introduction: The National Economic Recovery and COVID-19 Control Committee prioritize Healthy Indonesia, Working Indonesia, and Growing Indonesia activities. Working Indonesia is a control measure to keep business activities in Indonesia running and prevent a significant decline in productivity. The mining sector has contributed significantly to the Indonesian economy, and special efforts were held to keep it running. Objectives: This study aims to document mining occupational safety and health in the Indonesian mining sector to control COVID-19 spreading.

Methods: The study used the literature and documents of Occupational Health and Safety (OHS) related to the mining and COVID-19 pandemic. Data were analyzed narratively to find the terms of law and regulation, occupational health and safety services, covid 19 test, tracing and treatment, and documentation of best practices in mining to prevent spreading COVID 19 on mining in Indonesia.
Results: The mining sector is one of the essential businesses in Indonesia that is continuously active during the COVID-19 pandemic. Indonesia has a plethora of laws covering mining OHS, COVID-19 prevention and control guidelines in the enterprises, national and company COVID-19 vaccination program, and best practices of COVID-19 prevention program at the workplace.

Conclusion: The study concludes that mining in Indonesia continues to be active during the COVID-19 pandemic. OHS activities shifted to the COVID-19 prevention and control through regulations, guidelines, and best practices to continuously run the mining activities.

Sp12-4

Reaching industry milestones on noise induced hearing loss in the South African Mining Industry

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Introduction: Noise induced hearing loss (NIHL) continues to be a significant occupational disease in South African mines, accounting for 23.7% and 29% of all diseases in 2008 and 2019 respectively.

Interventions: Through the tripartite Mine Health and Safety Council, the industry has since 2003 utilised the setting and monitoring of aspirational milestones to eliminate occupational diseases, injuries and deaths. For noise, the milestones were: by December 2024, the total operational or process noise emitted by any equipment must not exceed a milestone sound pressure level of 107 dB(A); by December 2016, no employee’s standard threshold shift (STS) will exceed 25dB from the baseline when averaged at 2000, 3000 and 4000 Hz in one or both ears. These milestones were bolstered with interventions and monitoring by the Minerals Council South Africa and individual companies. Promotion and adoption of leading practices by the Minerals Council MOSH Learning Hub was implemented. The elimination of noisy equipment through the Industry Buy and Maintain Quiet (IBMQI) by eliminating noise at source was the mainstay of the industry’s response.

Results: By the end of 2020, the number of pieces of equipment emitting more than 107 dB(A) in the industry had fallen to 318, from 3221 in 2015. Cases of STS exceeding 25 dB had been reported in 2020.

Conclusion: Progress is being made with elimination of NIHL in the South African mining industry but more still needs to be done.

Sp12-5

Reducing disease and death from Artisanal and Small-scale Mining (ASM) – Collegium Ramazzini Statement

Stephan Bose-O’Reilly, Philip Landrigan, Johanna Elbel, Gunnar Nordberg, Roberto Lucchini, Casey Bartrem, Philippe Grandjean, Donna Mergler, Dingani Moy, Benoît Nemery, Margrit von Braun and Dennis Nowak, and the Collegium Ramazzini

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Artisanal and Small-Scale Mining (ASM) is one of the world’s most dangerous occupations. The World Bank estimates that 100 million children, women and men work in ASM worldwide, mostly in remote rural areas of Low-income and Lower-middle-income countries. There is an urgent need for responsible mining in the context of growing global demand for minerals and metals for climate change mitigation. ASM is increasing rapidly. Paradoxically, a key driver of this growth is climate change mitigation. Climate change mitigation drives ASM because ASM is a major source of minerals and metals. The World Bank projects that renewable energy systems will require significantly more minerals and metals than current fossil-fuel-based energy supply systems and that global demand for minerals and metals will continue to increase for many decades. The Collegium Ramazzini notes the gross injustice of ASM. While most ASM takes place in the Global South, in the same countries already suffering the most serious consequences of climate change, most who benefit from ASM are in the Global North and thus have a shared responsibility to encourage their governments to contribute to reducing ASM hazards. We cannot achieve climate change mitigation through the use of “blood minerals”. Reference to the full statement: https://www.collegiumramazzini.org/news.

Special Session 13 Preventing Tuberculosis and Lung Disease with Silica Dust Controls: The Case for Primary Prevention

Chair: Perry Gottesfeld and Marilyn Fingerhut

Session introduction

There is a Tuberculosis (TB) crisis in low- and middle-income countries that has only worsened since the Covid pandemic. This session will focus on the use of dust control measures in mining to reduce respirable silica dust exposures to prevent TB and lung disease. We will cover low-cost methods implemented in informal sector mining, controls applied to large-scale mining and examine the potential for dust controls to prevent TB in high-risk environments. This Session will illustrate examples of solutions and challenges in addressing TB and silicosis in formal and informal mining and stone carving.

Sp13-1

What Does Reduction of Silica Mean in Terms of Preventing TB?

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Introduction: Silica exposure is a substantial risk factor for TB disease: a recent systematic review found a pooled relative risk of TB in those with silicosis of 4.01 (95% CI 2.88 – 5.58). The TB risk was lower when silicosis was excluded. Infected workers can spread the disease to the general population; silica associated TB is thus a public health issue. This paper aimed to describe the burden of TB disease with silica dust controls: The Case for Primary Prevention