

Table S1: Characteristics of the included articles (Studies)

Row	Author/ Year/	Country of study	Sample size	Type of study	Silicosis diagnosis method	Prevalence	number of years of exposure to the risk factor	risk factors	age at diagnosis	relative risk - rate, risk or hazard ratio, or odds ratio
1	S. Ogawa (2003)	Japan (Kyoto)	Group I: 200 male workers initially Group II: 75 male disability compensation recipients	Historical Cohort Study with longitudinal follow-up	Chest radiography (standard films) Classification into Categories 0 to 4 according to the ILO (1980) guidelines	Group I at 1st examination (1952-56): 17% (Categories 1-4) Group I at 3rd examination (1995): 65% (Categories 1-4)	Ranged from <10 years to ≥40 years	Duration of service Radiographic category at previous examination Era of work initiation	Group I: Mean age at first examination: 33.5 ± 11.7 years. Group II: Mean age at first examination: 55.2 ± 10.7 years.	Group I: 36% progression over 15 years (between 2nd and 3rd examinations). Group II: 55% progression over 15 years.
2	M. Akgun (2008)	Turkey (Erzurum region)	157 former male denim sandblasters.	Cross-sectional survey (with a retrospective exposure assessment)	Chest radiography Evaluation according to the International Labor Office (ILO) classification.	53.1% (77 out of 145 subjects with interpretable radiographs)	Mean total exposure duration: 36 months (Range: 1–120 months). Mean latency period : 79 months (~6.5 years).	Seniority Total exposure duration. Duration of work as a foreman. Number of places of work. Number of sandblasting devices in the workplace (as an indicator of workspace size/conditions). Age at first exposure. Smoking status.	The mean age of the entire cohort was 23 years. The mean age at first exposure was 17 years.	Disease severity (ILO score) correlated with the number of places of work (r=0.32, p<0.01), total exposure duration (r=0.25, p<0.01), and especially the duration of work as a foreman (r=0.48, p<0.001).
3	J. M. M. Meijers(1990)	Netherlands	Gouda region (small workshops): 520 workers Maastricht (large companies): 1,975 workers Total for silicosis prevalence: 2,495 workers	Cross-sectional study.	Chest radiograph according to the International Labor Office (ILO) International Classification of Radiographs of Pneumoconioses (1971)	Gouda (small workshops): 13.3% Maastricht (large companies): 1.7% Overall (combined): 4.1% (102 out of 2495 workers)	not reported	Duration of exposure to quartz-containing dust. Type of industry Smoking habits	Not explicitly reported in the provided text	Ceramic Industry: OR = 1.11 (95% CI: 0.77–1.61) for "ever employed". Coal Mining Industry: OR = 0.95 (95% CI: 0.65–1.38) for "ever employed".

4	X. Liu(2023)	Global. Analysis of 204 countries include China, North Korea, Chile, Italy, Brazil, and Palau. UN	Incident cases (2019): 138,965 Prevalent cases (2019): 2,648,973	Systematic analysis and modeling of the Global Burden of Disease (GBD) data; a retrospective and predictive epidemiological study.	Systematic reviews Inpatient hospital reports Claims-based data Diagnosis codes: ICD-10 codes J62, J62.0, J62.8 (Pneumoconiosis due to dust containing silica).	Global Age-Standardized Prevalence Rate (ASPR) in 2019: 31.60 per 100,000. Country with highest ASPR: China (113.15 per 100,000).	Not explicitly reported in the article.	Occupational exposure to free crystalline silica (SiO ₂) Socio-Demographic Index (SDI) of regions/countries Age Geographic location Time (year).	The peak of incidence has shifted from the 35-39 age group in 1990 to the 50-54 age group in 2019.	Average Annual Percentage Change (AAPC): ASIR AAPC (1990-2019): -0.5% (95% CI: -0.7 to -0.3) ASPR AAPC (1990-2019): -0.2% (95% CI: -0.5 to 0.0) ASDR (DALY Rate) AAPC (1990-2019): -2.0% (95% CI: -2.2 to -1.8)
5	L. A. Tse(2007)	China (Jiangxi Province	574 male gold miners (from 583 invited, 9 were excluded due to incomplete information).	Cross-Sectional Study	Chest radiography Diagnosis by the Jiangxi Provincial Pneumoconiosis Diagnostic Panel according to the Chinese National Diagnostic Criteria (GB5906-86).	Overall Prevalence of Accelerated Silicosis: 29.1% (167 out of 574 workers; 95% CI: 24.8–33.4%).	Mean length of service (exposure): 5.6 years (Range: 2 months to 14 years)	Duration of service in the mine. History of tuberculosis. Smoking history. Age at first exposure.	Age at first exposure ranged from 11 to 53 years (median: 23 years). The mean age across different silicosis categories was similar, around 24-25 years.	the proportion with a history of tuberculosis was higher in silicotic miners (4.2%) than in non-silicotic miners (3.4%), but this difference was not statistically significant (p=0.66).
6	P. Vacek(2024) M.	United States of America (State of Vermont)	356 workers	A historical cohort study with long-term follow-up	Chest radiographs small opacities with a profusion of $\geq 1/0$ and a predominantly rounded shape, OR the presence of large opacities (A, B, or C).	14 out of 356 participants (3.9%)	All silicosis cases (14 workers) had been exposed for ≥ 30 years.	Occupational Exposure High-Risk Jobs Smoking	79 years (Range: 60-87)	An Odds Ratio (OR) or Hazard Ratio (HR) for silicosis itself was not reported.

7	A. Laney(2010) S.	United States of America	90,973 miners (who participated in the Coal Workers' X-ray Surveillance Program)	A cross-sectional analysis of surveillance data	Chest radiographs Specific focus on the presence of r-type opacities	Among all 90,973 radiographs, 321 (0.35%)	The analysis includes miners with "any mining tenure."	Occupational Exposure Job Type	median age : 1980-1989: 32.5 years 1990-1999: 42.8 years 2000-2008: 44.3 years	The PR for r-type opacities in the entire US for 2000+ vs. the 1980s was 3.1 (95% CI 2.4 to 4.1).
8	M. Karataş(2019)	Turkey	626 workers in total. 459 workers with silicosis. 167 workers without silicosis (control group).	Retrospective (case-control) study.	Chest X-rays according to the International Labour Organization (ILO) 2000 classification. High-Resolution Computed Tomography (HRCT)	prevalence of 73.3% within this hospital-based study group	14 years (range: 1-36 years) in the silicosis group. 10 years (range: 1-32 years) in the control group.	1. Age 2. Duration of work 3. Smoking 4. Working in high-risk departments	The median age of the silicosis group was 40 years (range: 23-60 years).	The study reports Odds Ratios (OR) from logistic regression analysis as the measure of association.
9	L. A. Tse(2015)	China	3,492 workers were included in the final analysis	Retrospective Cohort Study	according to the Chinese National Diagnostic Criteria of Pneumoconiosis which are similar to the ILO classification.	298 incident cases were identified by the end of 2008. The crude cumulative incidence rate was 8.53%.	The mean net years of dust exposure was 24.03 ± 9.09 years. All workers had a minimum of 1 year of exposure (an inclusion criterion).	1. Age at entry into the cohort 2. Mean concentration of respirable silica dust 3. Net years of dust exposure 4. Number of jobs held in the iron ore mine 5. Smoking status 6. Illiteracy	average age at first exposure for the entire cohort was 23.73 ± 6.36 years, and the average age at entry into the cohort was 27.62 ± 7.81 years.	Odds Ratios (OR) and Relative Risk (RR) are not reported; the analysis is based on time-to-event data, for which HR is the standard measure.
10	A. Mbuya(2024) W.	Tanzania	Total Sample: 660 participants 330 small-scale miners 330 peri-mining community members	Cross-sectional study	History of occupational exposure to respirable crystalline silica dust. chest X-rays interpreted according to the 2011 ILO Pneumoconiosis Classification System.	Among Miners: 99 out of 330 miners (30.0%) Overall Prevalence: 99 out of 660 participants (15.0%)	Median Work Duration for Miners: 5 years (IQR: 4–7 years) Work Duration Categories: ≤ 5 years: 179 miners (54.2%) 6–10 years: 117 miners (35.5%)	Work duration in the mines Income level Smoking status History of previous lung disease Tuberculosis status HIV status	Median age of miners: 35 years.	For Silicosis (Adjusted): Workers with 6–10 years of exposure: aOR = 0.52 Workers with >10 years of exposure: aOR = 0.34

							10 years: 34 miners (10.3%)	Diabetes mellitus Lung function status		
11	D. Knight(2020)	South Africa	14,221 miners were included in the final analysis.	A cross-sectional analysis of baseline survey data from a cluster-randomized trial	Chest radiographs Two profusion thresholds were used: > 1/0 and > 1/1.	The crude prevalence of silicosis (ILO profusion $\geq$ 1/1) was 3.8% (535/14,221).	19 years (range: 0–52 years). 95.5% of miners with silicosis had >15 years since first exposure.	1. Years since entry into the industry 2. Age 3. Racial Ascription 4. Underground Work Status 5. Country of Origin 6. Mine Shaft/Cluster	The median age of the entire study sample was 43 years (range: 18–70).	The study reports AC13:L13djusted Odds Ratios (aOR) from multivariable logistic regression models as the primary measure of association.
12	R. F. Hoy(2023)	Australia	414 workers met the criteria and underwent the definitive secondary screening	A Cross-Sectional Study	A compatible occupational history of exposure in the stone benchtop industry. HRCT (High-Resolution Computed Tomography)	28.3% (117 out of 414 workers).	12 years (Interquartile Range, IQR: 9 to 21 years).	Duration of work in the industry Age BMI Smoking status and pack-years Country of birth Number of SBI jobs held Intensity of exposure to dry processing of stone Overall estimated silica exposure category	The median age : 42.1 years (IQR: 34.8 to 49.7 years)	SBI Career Duration (per year): aOR = 1.08 (95% CI: 1.04 to 1.12) Being a Former or Current Smoker (vs. Never Smoker): OR = 2.17 (95% CI: 1.32 to 3.56) High/Very High Estimated Silica Exposure (vs. Low/Medium): OR = 4.46 (95% CI: 1.65 to 12.07)

13	H. W. Kuo(1998)	Taiwan	718 workers	Cross-sectional	chest radiograph evaluated according to the International Labour Organization (ILO)	7.5% (38 out of 718 workers)	Molding Workers: 14.9 ± 10.1 years Furnace Workers: 13.4 ± 10.5 years Post-treatment Workers: 5.9 ± 7.6 years Administrative Workers (Control): 6.1 ± 10.1 years	Job type in the foundry Length of dust exposure Smoking High concentrations of dust with a high proportion of free silica	Furnace workers (45.1 years) and Molding workers (40.4 years).	The Odds Ratio (OR) : Furnace Workers: OR = 10.63 Post-treatment Workers: OR = 6.63 Molding Workers: OR = 5.41 Smoking (per pack-year): OR = 1.50 Length of Exposure (per year): OR = 2.54
14	A. S. Trapido(1998)	South Africa	238 former mineworkers (from an original random sample of 800)	Community-based, cross-sectional study	chest radiograph according to the International Labour Organisation (ILO) classification	22% (Reader 2) and 36% (Reader 1).	Mean total service: 12 ± 7 years Mean confirmed service: 9.3 ± 7.2 years	Length of mine service Job type Age Presence of tuberculosis	52.8 ± 10 years.	A specific OR is not provided
15	J. Q. Zhao(2019)	China (Hebei Province)	1,519 young adult pneumoconiosis cases (out of a total of 6,966 cases from all ages)	Retrospective cross-sectional study (analysis of national surveillance system data)	Diagnosis based on the Chinese "Diagnostic Criteria of Pneumoconiosis"	21.8% (1,519 out of 6,966) of all pneumoconiosis cases were in young adults (24-44 years).	Mean duration of dust exposure for young adults: 11.1 ± 6.6 years	Type of pneumoconiosis Working in Small and Medium Enterprises Specific industries Being a migrant worker Earlier calendar year of first dust exposure	The mean age at diagnosis for the young adult group was 40.0 ± 3.7 years.	A specific OR for key risk factors is not provided

16	G. M. H. Swaen(1988)	The Netherlands	2,495 workers	Cross-sectional study	Chest radiograph using the ILO classification	Gouda (small workshops): 13.3% Maastricht (large companies): 1.7% Overall (combined): 4.1% (102 out of 2495)	For workers with ≥ 30 years of exposure, the prevalence was 30.1% in Gouda and 13.0% in Maastricht.	Duration of exposure to quartz-containing dust. Type of workplace Heavy smoking	Not reported in the provided text	The overall odds ratio for smokers (any) vs. non-smokers was 1.2.
17	E. Rafeemanesh (2014)	Iran	170 workers	Cross-sectional study	Chest radiography according to the ILO classification system (2000).	Silicosis: 12.9% (95% CI: 7.9%–18.0%) Simple Silicosis: 10.6% Complicated Silicosis: 2.4%	Mean work duration: 13 ± 8.2 years Median exposure duration: 10 years (IQR 13)	Duration of silica dust exposure Poor ventilation in workshops. Inappropriate personal protection	The mean age of participants was 31.2 ± 10.1 years.	1.48 (for each additional year of exposure).
18	T. P. Souza (2021)	Brazil (State of Rio Grande do Sul, southern region)	258 artisanal mine orkers	Cross-sectional study	Self-reported diagnosis confirmed by medical records	Self-reported Silicosis: 10.5%	31.4% (81 workers) had worked for >20 years.	Duration of mining work Age Pack-years of tobacco use Low educational level	The mean age of workers with silicosis was 52.59 (± 7.21) years	PR for work duration (>20 years): 3.08 PR for age (per year): 1.13 (95% CI: 1.08–1.20) PR for pack-years of smoking: 1.03 (95% CI: 1.02–1.05)
19	H. Quan (2022)	China	A total of 259 silicosis patients	A retrospective cohort study	High-Resolution Computed Tomography (HRCT) and pulmonary function tests.	Among the 132 patients with follow-up, 66 patients (50.0%) showed disease progression. the non-artificial stone group.	Artificial Stone (AS) Group: Median dust exposure years = 7.0 years (IQR, 5.0, 8.0). Non-Artificial Stone (non-AS) Group: Median dust exposure years = 18.0 years (IQR, 10.0, 27.0)	Working experience with artificial stone processing. Complicated silicosis on CT images.	35.5 years (IQR, 29.9, 46.4) in the AS group and 51.4 years (IQR, 45.5, 58.9) in the non-AS group	Working experience of AS processing: HR = 5.671 Complicated silicosis: HR = 2.373

20	K. Kreiss (1996)	United States	134 men aged 40 and older participated	A community-based, cross-sectional study	chest radiographs according to the ILO 1980 classification	Among the 100 dust-exposed subjects, the prevalence of silicosis was 32%	The mean years of dust exposure for silicotic miners was 27.6 years, and for nonsilicotic miners was 22.9 years.	exposure to respirable crystalline silica dust and time since last exposure as significant predictors of silicosis risk.	The mean age of silicotic miners was 64.3 years.	Cumulative Silica Exposure (per 1 mg/m³-year increase): OR = 4.9 (95% CI: 2.3–10.5) Average Silica Exposure (per 0.05 mg/m³ increase): OR = 7.4 (95% CI: 2.7–20.4) Time Since Last Exposure (per 10-year increase): OR = 2.1 (95% CI: 1.3–3.4)
21	E. McCanlies (2002)	United States	387 individuals	A case-control study	pathological assessment of lung tissue at autopsy, graded according to NIOSH/CAP standards	Not applicable in the traditional sense	Cases: Mean exposure = 33.6 years ($\pm$ 11.1) Controls: Mean exposure = 21.5 years ($\pm$ 13.5)	Occupational Exposure: Genetic Factors: Minor variants in the genes coding for: Tumor Necrosis Factor-α (TNFα) Interleukin-1α (IL-1α) Interleukin-1 Receptor Antagonist (IL-1RA)	The mean age at death for cases was 68.5 years ($\pm$ 9.0). For controls, it was 62.9 years ($\pm$ 8.1).	The highest decile had 7.6 times the proportion of cases compared to the lowest decile
22	A. Farazi(2015)	Iran	3,121 workers	Analytical Cross-Sectional Study	Questionnaire Clinical Examination Spirometry Chest X-ray Tuberculin Skin Test (TST) Sputum smear (Ziehl-Neelsen stain) and culture	Prevalence of TB in workers with silicosis: 917 per 100,000 people	The mean employment duration (proxy for exposure) was 14.9 $\pm$ 6.8 years.	Age Employment duration Exposure duration Smoking	The mean age for silicosis workers was 45.1 $\pm$ 12.7 years.	Age > 30 years: OR = 1.97, 95% CI (1.12 - 3.46) Employment duration > 10 years: OR = 2.32, 95% CI (1.32 - 4.10) Exposure duration > 5 years: OR = 2.07,

					on LJ Medium Diagnosis confirmed according to WHO, ATS, and ILO guidelines.					95% CI (1.10 - 3.88) Smoking > 5 pack-years: OR = 3.11, 95% CI (1.30 - 7.44)
23	N. Chaudhury(2010)	India	160 agate workers.	Retrospective analysis of clinic-based data.	Based on occupational history and chest radiographs interpreted according to the ILO classification	69.4% (111 out of 160 workers)	Mean duration of exposure was 17.2 years (SD $\pm$ 8.2).	Work in agate processing	The mean age at diagnosis for silicosis cases can be inferred to be similarly young.	not reported
24	J. C. Fazio (2023)	United States (California)	52 male workers.	Case series.	Confirmed by histopathology (lung biopsy) or chest imaging (radiograph or CT)	Not a prevalence study; this is a case series reporting on 52 identified cases.	Median duration of work (exposure) was 15 years (IQR, 10-20).	Fabrication of engineered stone, inadequate use of respiratory protection lack of wet methods for dust control	Median age was 45 years (IQR, 35-52)	it is a descriptive report of identified cases, not an analytical study comparing groups
25	O. Metadilogkul (1988)	Thailand	243 workers (current and former)	Cross-sectional study.	chest radiographs according to the ILO 1980	Overall prevalence: 25.5% (62 out of 243 workers). Among these cases, 21% had complicated silicosis (Progressive Massive Fibrosis - PMF)	The primary risk factor was duration of exposure. Workers with more than 10 years of exposure had a significantly higher risk of developing silicosis.	Longer Duration of Work Job Task Smoking	The mean age of workers diagnosed with silicosis was 49.2 years.	The analysis primarily reports prevalence and uses p-values to indicate statistical significance of associations

26	M. Akgun (2015)	Turkey (Erzurum province)	Initial cohort (2007): 145 former sandblasters Reassessed in 2011: 83 workers (74 living participants + 9 deceased)	Cohort Study	Chest Radiograph according to the ILO classification	Prevalence of Silicosis in 2007: 60.2% (50 out of 83) Prevalence of Silicosis in 2011: 96.4% (80 out of 83) Prevalence among Living Participants in 2011: 95.9% (71 out of 74)	Mean Exposure Duration: 41 ± 27 months (approximately 3.4 years). A significant risk factor was exposure duration > 5 years, but the mean was lower, showing disease can develop after short, intense exposure.	Younger age Never smoking Working as a foreman exposure Sleeping at the workplace Number of different denim-sandblasting places of work	Mean Age of Living Participants in 2011: 27 ± 6 years. Mean Age at Death: 24 years (range 18-29 years).	For Mortality: OR = 3.16 (95% CI: 1.46 - 6.85) The odds of death increased by 3.16 times.
27	T. P. Souza (2017)	Brazil	348 workers (including current workers and retirees).	Prospective cross-sectional study.	A history of silica exposure. Chest X-ray according to the ILO International Classification	Prevalence among current active miners: 28% (87 out of 306).	Duration of Silica Exposure in workers with silicosis (28.3 ± 10.4 years) compared to those without (15.7 ± 9.9 years). Age at Diagnosis/Older Age: Workers with silicosis were older (mean 47.5 ± 9.9 years) compared to those without (mean 35.7 ± 10.7 years).	Absence of Ventilation System & Use of Dry Drilling Process: Lower Education Level Longer Duration of Silica Exposure (per additional year)	The mean age of workers diagnosed with silicosis was 47.5 years	Absence of ventilation system and use of dry drilling process: PR = 1.52 (95% CI: 1.17 - 1.99) Education (per additional year of education): PR = 0.87 (95% CI: 0.81 - 0.93) Duration of silica exposure (per additional year of exposure): PR = 1.04 (95% CI: 1.03 - 1.06)
28	X. Song (2022)	Country: China	15,402 pneumoconiosis cases.	Retrospective cohort study (Survival analysis).	Diagnosed by qualified institutions according to Chinese diagnostic criteria (e.g., GBZ 70-2015). Based on professional	Not a prevalence study, but reports distribution of types among the cases: Silicosis: 68.49% (10,549 cases)	Overall Mean Dust Exposure Time: 16.24 ± 9.89 years (for Stage I) The dust exposure period generally	Longer dust exposure years First diagnosis at a higher stage (II or III) Progression of the disease (Upgrade from I to II or I to III)	Overall Mean Age of Onset: 54.14 ± 11.18 years (for Stage I) The age of onset increased with the stage of diagnosis.	Dust exposure: 1.081 First diagnostic stage II: 1.612 First diagnostic stage III: 2.371 Progression from stage I to II:

					history and chest radiographs.	Coal Workers' Pneumoconiosis (CWP): 19.41% (2,990 cases) Welder's Pneumoconiosis: 3.84% (591 cases) Stage Distribution at First Diagnosis: Stage I: 80.00% Stage II: 15.49% Stage III: 4.51%	ranged from 1 to 58 years.	Low economic level		1.232 Progression from stage I to III: 1.673 Low economic level: 1.103 Coal workers' pneumoconiosis: 0.761 Welders' pneumoconiosis: 0.435 Manufacturing industry: 0.642 Public management and social security: 0.438
29	D. Moyo (2022)	Zimbabwe	3,821 artisanal and small-scale miners	Cross-sectional study	Chest X-ray according to the ILO Classification	Overall Prevalence: 19% (666 out of 3,547 miners with complete data) 95% Confidence Interval (CI): 17.5% – 20.1%	The mean age of the miners was 35.5 years	Male Gender HIV-Positive Status Longer Duration of Mining Work Higher Severity of Exposure to Silica Dust	The population with a mean age of 35.5 years.	High Burden of Comorbidities: A triple burden of Silicosis (19%), Tuberculosis (6.8%)
30	Mohebi (2006)	Iran	17 silicosis patients	Cross-sectional study	spirometry Chest radiography and in some cases HRCT Plethysmography Tuberculin skin test (PPD) Sputum smear and culture for tuberculosis Autopsy in one deceased case	Prevalence in the larger community is not reported. This study focuses on 17 identified cases of severe silicosis.	Average length of employment (contact): up to 5 years (all 17 patients had less than 5 years of work experience). Daily working hours: up to 14 hours per day."	"Extreme exposure to silica dust in a highly polluted work environment Lack of proper ventilation Lack of use of personal protective equipment (masks) Long working hours	"Mean age of patients: 22 years Median age: 20 years Age range: 20 to 35 years 15 (88.2%) of patients were younger than 20 years."	study reported cases more descriptively

					Radiographic interpretation according to ILO standards			Working in small workshops without health supervision"		
31	Masoudi (2009)	Iran	117 mine workers	Cross-sectional study	"Standard Respiratory Questionnaire Interview Physical Lung Examination Spirometry Test Chest X-ray Mantoux Test (to screen for tuberculosis)"	Prevalence rate of silicosis: $(8 / 117) * 100 \approx 6.8\%$ "	Average years of work for the entire sample: 11.5 years Average years of work for silicosis sufferers: about 30 years	Long-term exposure to silica dust Type of work Age History of smoking Failure to use personal protective equipment	Average age of all workers studied: 42.9 years Average age of those with silicosis: 44.68 years (standard deviation ± 6.16)	study reported cases more descriptively
32	Qarini (2009)	Iran	143 Foundry workers	Cross-sectional study	American Thoracic Society (ATS) Standard Respiratory Questionnaire Chest radiography (CXR) for all individuals Radiographic interpretation based on ILO Micro lab spirometry based on ATS criteria Final diagnosis: Based on history of silica exposure + radiographic changes consistent with silicosis"	Prevalence rate of silicosis: $(9 / 143) * 100 \approx 6.3\%$ "	Mean duration of exposure for affected individuals: 2.93 ± 11.88 years (range: 8-19 years) Mean duration of exposure for non-affected individuals: 2.75 ± 11.85 years (range: 8-21 years)	Age Work history Exposure to silica dust Smoking Workplace Silica concentration in the workplace	Mean age of patients: 45.55 ± 7 years (range: 37-55 years) Mean age of non-patients: 43.94 ± 5.62 years (range: 33-59 years) Age difference: 1.61 years (non-significant, $P = 0.413$)"	study reported cases more descriptively

Table S2: Vote-Counting Matrix: Silicosis Risk Factors by Study

Study	Workplace Conditions							Health Status										Socioeconomic & Demographic									
	High silica exposure (concentration, cumulative dose, or intensity)	Longer duration of exposure / employment	High-risk job type, multiple workplaces, or specific work sections	Underground or full-time mining work	Poor workplace environment (no ventilation, dry drilling, small enterprises)	Longer daily working hours	Use of respiratory protective equipment	Smoking (current/former, or >5–10 pack-years)	History of tuberculosis	History of pneumonia	HIV positive status	Advanced disease severity / complexity / silicosis / progressive massive fibrosis	Mixed obstructive–restrictive lung disease / lung function impairment	Higher dyspnea score	Genetic interactions (IL-1 α , IL-1RA, TNF α) combined with occupational exposure	Smoking combined with decrease in DLCO (artificial stone group)	Higher BMD	Older age / advanced age at entry or diagnosis	Male gender	Lower education level / illiteracy / no formal education	Higher education level	Black race	Mozambican nationality (vs South African)	Residence in high-risk geographic region (Appalachian coal mining areas)	High Socio-demographic Index (SDI)		
Metadilogkul 1988		↑																↑	↑								
Swaen 1988	↑																										
Kreiss 1996	↑																										
Kuo 1998	↑	↑			↑			↑																			
Trapido 1998		↑																↑									
McCanlies 2002															↑			↑									
Ogawa 2003		↑										↑	↑					↑									
Chaudhury 2010		↑																									
Laney 2010		↑										↑												↑			
Rafeemanesh 2014		↑																↑									

Akgun 2015			↑																					
Farazi 2015		↑						↑									↑							
Tse 2015	↑	↑	↑					↑									↑		↑					
Souza 2017			↑		↑	↑	↓	↑									↑			↓				
Karataş 2019		↑	↑					↑									↑							
Zhao 2019		↑		↑	↑						↑													
Knight 2020	↑	↑		↑													↑				↑	↓		
Souza 2021		↑						↑								↓	↑							
Moyo 2022	↑	↑							↑	↑	↑							↑	↑					
Quan 2022	↑							↑			↑				↑									
Song 2022			↑						↑		↑						↑			↓				
Hoy 2023	↑							↑					↑			↓	↑							
Liu 2023																							↓	
Mbuya 2024		↑									↑	↑												
Vacek 2024	↑		↑																					

Note: ↑ = significant association with increased risk ↓ = significant protective association blank = not reported