

Silica

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Retrospective mortality cohort study of Italian workers compensated for silicosis

The established associations between silicosis and TB and with pneumoconiosis were confirmed. Support for an association with liver cancer in men is demonstrated. There was very weak support for links with kidney disease and, lung cancer.

The study cohort included nearly 15,000 men and women who had received compensation for silicosis between 1946 and 1979, and were still alive in 1980. Mortality outcomes were followed up from 1980 until 1999; data was obtained from official registries working to ICD-9. The degree of silicosis and year of compensation were tested to see if they predicted any specific causes/times of death. Mortality rates were compared to those of the local population.

There were 8,521 deaths during the observation period and principal cause of death was readily available in 90% of these cases.

Degree of silicosis was recorded as either more than or less than 31% work disability at the time of compensation. This is equivalent to a 55% loss of respiratory capacity and may reflect the extent of silicosis damage in the lung. This threshold was chosen simply to ensure that there were equal numbers of person years of observation in both groups, i.e. for statistical power reasons. In fact this meant that only 20% of the cohort was in the higher disability group.

The mean age at compensation was 52. Mean time between compensation and death was 21 years.

There was no correction for history of smoking, alcohol consumption or hepatitis.

High mortality ratios were observed for the following outcomes (significant figures as reported in the paper):

Recorded Cause of Death	Mortality ratio; Male = M, Female = F	95% confidence interval
Tuberculosis	M = 2.89 F = 10.47	2.20–3.80 4.24–25.85
Liver Cancer	M = 2.15 F = 0.97	1.84–2.51 0.28–3.36
Trachea, bronchus, lung cancer	M = 1.10 F = 1.07	1.03–1.18 0.51–2.26
Respiratory System disease	M = 2.49 F = 2.24	2.38–2.60 1.69–2.96
Anthrasilicosis	M = 25.34	7.31–87.90
Asbestosis	M = 8.48	2.44–29.40
Silicosis	M = 21.73 F = 536.75	20.58–22.94 380.04–758.08
Other pneumoconiosis	M = 19.69	14.36 – 27.00

There was no significant increase in mortality from mesothelioma, cardiovascular disease, kidney disease, nasal cancer or cancer of the larynx.

Compensation for silicosis was strongly predictive of death from silicosis, asbestosis (in men, but only if compensated within 10 years of the beginning of the study), anthra-silicosis (equivalent to coal workers pneumoconiosis) in men, tuberculosis in women and 'other pneumoconioses' in men. The strength of these relationships would satisfy the causal presumption test. There was a moderate relationship with death from other respiratory disease in men and women and liver cancer in men. There was a very weak link with lung cancer in men.

Overall, those with silicosis had a longer life expectancy than their age equivalents in the same geographical region. The authors assert this is a result of the healthy worker effect but offer no supporting analysis.

The authors claim that a separate analysis for those with higher levels of incapacity at the date of compensation shows stronger relationships with tuberculosis, liver cancer, respiratory tract cancer and respiratory system disease; but this analysis is not presented. If an effect increases with dose, this strengthens the claim for a causal association.

Comment

Other studies of silicosis compensation claimants have shown stronger links with lung cancer than those found here; the values reported here would not be regarded as significant when assessing an individual claim. There was no correction for smoking history or exposure to asbestos and the association was only statistically significant for men. By itself, the result here would not lead to a conclusion that either silicosis or silica itself were causes of lung cancer.

The suggestion of a link between silicosis and liver cancer is reproduced in several previous studies. Again, however, there is no correction for well known confounding factors.

Weaknesses of the study:

A death certificate is not a reliable record of factors which may have contributed to death when there is more than one disease present. The reason for seeking compensation for silicosis is also unreliable and the degree of loss associated with silicosis can be subjective.

Strengths of the study:

A large cohort was observed for an appropriate follow-up period. Silicosis status had been objectively assessed and recorded, death certificates are completed regardless of silicosis compensation status.

Conclusion:

The study was able to reinforce the view that silicosis increases the risk of TB and pneumoconiosis and that links with cardiovascular disease, kidney disease and cancers are either very weak or insignificant.

