

Grant AFC215-31

Title: Revisiting Lung Cancer Risk from Silica Exposure in Miners: Proposed Standards, Prevailing Biases and Modern Methodology

Organization: University of California, Berkeley

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Partnerships: University of California, San Diego

Focus Area: Injury and Disease Exposure and Risk Factors

Topical Area: Respiratory Disease

Problem Statement and Justification: Silica is one of the most common occupational exposures worldwide and silicosis is the oldest known occupational disease. The Mine Safety and Health Administration (MSHA) plans to propose a more stringent silica standard has prompted industry to suggest that the current permissible exposure limit (PEL), twice the proposed level, is adequate to protect worker health. In addition to causing silicosis, silica has been classified as a human carcinogen by the International Agency for Research on Cancer (IARC), however the association between silica and lung cancer is still controversial. Much of the controversy stems from inconsistencies in results from occupational epidemiology studies. There are, however, several systematic biases that lead to the underestimation of effects from occupational studies and it is reasonable to expect that these biases are particularly strong in studies of silica and lung cancer. We propose to reanalyze Checkoway's cohort of diatomaceous earth miners, one of the studies that influenced the IARC classification, to address these biases and further illuminate the shape of the exposure-response curve at the levels of the existing and proposed PELs.

Impact of the Research: Evaluating the impact of silica exposure on the lung cancer risk of miners requires the application of modern statistical methods to address the prevailing biases in occupational epidemiology. Our objectives are to apply such methods to four areas of concern in the diatomaceous earth cohort: the entanglement of duration with exposure rate, competing risk by silicosis, the role of silicosis in the development of silica-related lung cancer, and the healthy worker survivor effect. A better understanding of the effect of silica on lung cancer will help inform standards and protect the health of miners and other workers exposed to silica.

Objectives and Research Approach: Although methods have been developed to address the prevailing biases in occupational epidemiology, they have not yet been applied to understand the health effects of silica in cohorts of miners. Our research group is well poised to apply these methods to Checkoway's cohort of silica-exposed miners and to interpret them to maximize the transportability into worker protection policy. We anticipate producing four original manuscripts for publication in peer-review journals; one paper for each objective. These papers will help further the field of occupational epidemiology to promote methods that will better illuminate the health risks of workers in general and of silica-exposed diatomaceous earth miners in particular.