Grant: AFC316-53
Title: Linkage of Active Miner Surveillance, Former Miner Disability Evaluations, and Mortality Data Sets to Evaluate and Prevent Lifetime Risk of Cardiopulmonary Disease in U.S. Miners

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Partnerships: National Institute for Occupational Safety and Health, Department of Labor

Topic: Injury and Disease Exposure and Risk Factors
Priority Area: Surveillance and Epidemiology Methods

Problem Statement and Justification: There are an estimated 83,000 coal, 71,000 metal/non-metal and 99,000 stone/sand/gravel miners actively employed in the United States. The number of former miners is more difficult to ascertain but is likely much higher; the United Mine Workers of America (UMWA) health and pension funds provide for more than 77,000 miners, which represent only a portion of former coal workers. Miners suffer an excess of chronic respiratory diseases as well as other adverse health effects from their occupational exposures despite modern mining technology, dust control methods, and dust control regulations. Coal miners are a unique subset of miners for whom several national data sets exist that allow in-depth study of their health, data that has broad applicability to other populations of miners. Occupational exposure to coal mine dust can cause a broad spectrum of respiratory diseases, includng lung funciton impairment, and chronic obstructive pulmonary disease (COPD), encompassed by the term coal mine dust lung disease (CMDLD). Despite remarkable progress in reducing pneumoconiosis in coal miners after implementation of the Federal Coal Mine Health and Safety Act of 1969 (The Act), recently this trend has reversed. Equally disturbing is the increased incidence of rapidly progressive pneumoconiosis (RPP) and progressive massive fibrosis (PMF) now being seen in relatively young coal miners. Recent studies have drawn attention to the causal importance of the respirable silica component of coal mine dust in these diseases. The U.S. mining population is also exposed to the stress of noise, vibration, shift work, and diesel exhaust, all of which have been associated with adverse health outcomes with the potential for increased mortality.

Impact of the Research: Our research builds on findings from our first Alpha Foundation project in which we analyzed 50,000 Department of Labor (DOL) Black Lung Benefits Program (BLBP) claims filed between 2000 and 2013. This data showed substantial lung function impairment and a higher proportion of severe pneumoconiosis on radiographs of coal miners who started working after passage of dust control regulations in 1970. Our current proposed study will link demographic, radiologic, and physiologic data from two large miners' lung health data sets for the first time. These are the National Institute for Occupational Safety and Health (NIOSH) Coal Workers' Health Surveillance Program (CWHSP) of younger active miners and the DOL BLBP data on mainly former miners, and add mortality data from the National Death Index (NDI). Specific Aim 1 will link these data sets to better characterize miner populations over the adult lifespan and factors associated with participation in each program. Specific Aim 2 will examine these data sets to identify factors that affect the severity and rate of progression of lung disease. Specific Aim 3 will analyze all-cause mortality as well as cause-specific mortality rates to examine the burden of cardiopulmonary disease among miners compared to non-miners from the National Vital Statistics System (NVSS) and the National Health and Nutrition Examination Survey (NHANES). Findings will provide in-depth information on workplace and personal risk factors for these diseases and their progression in miners; inform targeted health promotion and prevention strategies; and support evidence-based policies for use by industry, labor and regulatory bodies to meet the emerging health needs of the U.S. mining population.

Objectives and Research Approach: Our research approach will provide the first-ever linkage of three large data sets (CWHSP, BLBP and NDI) using deterministic and probabilistic methods to evaluate cardiopulmonary disease during and after mining employment. Major expected outputs include: 1) information on demographic, geographic and employment characteristics of diseased miners who appear in both the CWHSP and BLBP data sets; 2) insight into risk factors for and rates of longitudinal lung radiographic progression and physiologic decline in these populations; and 3) information on all-cause mortality as well as cause-specific mortality with a special focus on respiratory and cardiovascular causes in deceased miners in relation to demographic, personal, clinical, and occupational risk factors. These findings will inform future efforts focused on prevention and early detection of cardiovascular disease and mining-related lung disease.