

Project Title: Whole Body Vibration Exposure and Injury Prevention of Heavy Equipment Operators in Open Pit Coal Mines.

Organization: Northeastern University

Partnerships: University of Washington, Seattle
Javeriana University
Cerrejón (Mine Industry Partner)

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Focus Area: Health

SYNOPSIS

Problem Statement and Justification: Miners who operate heavy equipment vehicles (HEV) in open pit mines have a high prevalence of musculoskeletal disorders (MSDs). While sedentary for most of the day these miners are also exposed to whole body vibration, especially shock impulse vibration due to the operation of HEVs including. For example, the operation of HEVs such as hydraulic shovels and load haul trucks during aggregate transfer during the extraction process in mining operations exposes workers to shock impulse vibrations. Whole- body vibration (WBV) is one of the leading risk factors for the development of low back musculoskeletal disorders and other general health outcomes among professional vehicle operators. Epidemiological and physiological studies demonstrate consistent associations between exposure to WBV from professional driving and occupational back pain and disability with the risk of injury increasing as WBV duration and dose increase.

Impact of the Research: Due to the high rate of injuries and MSDs in the mining industry, this research will have direct impact on miners' health by addressing a common exposure, WBV and its effect on their health. Our specific goals are to:

- (1) Characterize workers' peak and impulsive shock WBV exposure utilizing improved WBV exposure metrics that better capture these shock WBV during the operation of study HEVs.
- (2) Test associations between these improved WBV exposure metrics and MSD related absenteeism recorded in our partner's employee occupational health records, HEV operating logs.
- (3) Identify potential engineering controls and seat suspension technology to reduce the exposure to these peak and impulsive shock WBV.

The specific impact of these goals will be to (1) identify sources of exposure to WBV using innovative exposure metrics, (2) identify of exposure and health outcome relationships, mainly absenteeism due to MSDs, and (3) identify engineering controls that can be implemented as a primary prevention effort.

Objective(s) and Research Approach: The broad objective for this research is to characterize whole body vibration exposures in order to develop feasible and effective approaches for reducing exposure to whole body vibration among heavy equipment vehicle operators in mines. Our approach has multiple complementary facets that combine several health and safety methods, specifically, completed detailed exposure assessment and exposure assessment modeling for all workers, the utilization of administrative data to examine the health and safety of an employee cohort, and surveillance of workers to examine work environment and individual factors and their associations with the health outcomes. In achieving the goals will develop a better understanding of interactions between the physical exposure and both work environment and individual factors in order to improve miners overall health and safety.