

Mining Safety and Health Research at NIOSH

An assessment of the National Institute for Occupational Safety and Health (NIOSH) Mining Safety and Health Research Program (Mining Program) reveals that it makes essential contributions to the enhancement of health and safety in the mining industry. To further increase its effectiveness, the Mining Program should proactively identify workplace hazards and establish more challenging and innovative goals toward hazard reduction. The ability of the program to successfully expand its activities, however, depends on available funding.

The U.S. mining sector, which employs approximately 331,000 people, has one of the highest fatality rates of any industry in the country. Injuries and fatalities occur due to accidents during mining operations, and gases, dusts, chemicals, noise, extreme temperatures, and other physical conditions can cause chronic and sometimes fatal illnesses in mine workers. Fortunately, advances made over the past three decades in mining technology, equipment, processes, procedures, and workforce education and training have significantly improved safety and health. The NIOSH Mining Program has played a large role in these improvements.

Coal production in the United States is expected to increase to 1.8 billion tons annually by the year 2030, compared to current production of 1.1 billion tons. Sand, gravel, and stone mining production is also likely to grow, and increasing prices and demand for metals and nonmetallic minerals are driving up their production. This increased demand will lead to new technologies but also to new hazards in the mining workplace.

In 2004, NIOSH asked the National Academies to convene committees to review up to 15 of its research programs. This report evaluates the NIOSH Mining Program with respect to: 1) the relevance of its work to improvements in mining safety and health, and 2) the impact of the program's research on reductions in workplace illnesses and injuries. The report also assesses the program's targeting of new research areas and identifies emerging issues.



Photo courtesy Stephen Signer, NIOSH

MISSION OF THE NIOSH MINING PROGRAM

The Mining Program conducts research to eliminate occupational diseases, injuries and fatalities from the mining workplace. It currently conducts research in seven areas: (1) respiratory disease prevention; (2) noise-induced hearing loss prevention; (3) cumulative musculoskeletal injury prevention; (4) traumatic injury prevention; (5) mine disaster prevention and control; (6) ground failure prevention; and (7) surveillance, training, and intervention effectiveness.

There are many examples of how the Mining Program's research activities have led to improved health and safety at mining worksites. One example is the development of the personal dust monitor in cooperation with mine operators, mine worker unions, the Mine Safety and Health Administration, and the device manufacturer. The personal dust monitor is a direct-reading dust sampler, still in development, that will provide miners and mine operators with real-time information about dust exposure. It is expected to help reduce exposure to dust and could result in the most significant change in dust sampling methodology in more than 50 years.

ASSESSMENT OF RESEARCH RELEVANCE AND IMPACT

In assessing the contributions of the Mining Program to improvements in worker health and safety, a five-point scale (with 5 being the highest score) was used to summarize its evaluation of both relevance and impact of the work (see Box 1). The scale was developed by a separate committee to be used in a series of National Academies assessments of NIOSH programs. Relevance was evaluated in terms of the priority of work carried out and its connection to improvements in workplace protection, whereas impact was evaluated in terms of contributions to worker health and safety. The NIOSH Mining program scored a 4 out of 5 for both relevance of its work and impact of its research, based on the committee's assessment.

RECOMMENDATIONS FOR PROGRAM IMPROVEMENT AND FUTURE WORK

The report includes several recommendations on how the Mining Program could strengthen its

contribution to mining health and safety. Following is a summary of those recommendations.

Program Planning and Strategic Goals

The Mining Program's mission and goals are appropriate, but it should establish more challenging, innovative goals and attendant objectives. The Mining Program should set its goals to take a more proactive approach in identifying and controlling hazards to eliminate illnesses and injuries, including those that arise from changing mining conditions and technologies. Using surveillance data in combination with expanded external input to identify key priorities would help the program develop a more proactive approach to hazard identification and control.

Effective Interactions

The Mining Program interacts with numerous researchers, regulators, and other stakeholders. Interaction with other NIOSH programs should be increased, as should interaction with extramural researchers, and with the Mine Safety and Health Administration, where research needs are closely aligned with its legislative priorities. Partnering with industry should be done more broadly so that research results can be more widely applied throughout the industry. The program should also fully utilize outside technical expertise through a vibrant extramural and contract research program.

Outputs

Outputs are the products of NIOSH activities such as publications, reports, conferences, databases, tool, methods, guidelines, recommendations, education and training, and patents. The Mining Program should place greater emphasis on outputs that are preferred by mining operators, miners, and other nontechnical users. Feedback from potential users can help assess and improve outputs before they are released. Additionally, information on output quality should be collected and tracked.

Surveillance and Monitoring

The collection of surveillance data is extremely important in monitoring worker health and safety conditions and determining the effectiveness of Mining Program activities. The Mining Program should make better use of existing surveillance data

on mining-related incidents, injuries, and illnesses, and work to make these surveillance programs more robust. Recent advances in remote sensing, and diagnostic methods should be evaluated, improved, and shared with mine operators for timely detection and avoidance of mine hazards.

Training Programs and Technology Transfer

Training should be incorporated into the strategic goals of all research areas, and plans for technology transfer should explicitly include how small business worker populations (mining companies with fewer than 50 employees) will be served. To improve training, the Mining Program should determine who will likely use the results of its research. With respect to information dissemination, a more proactive and strategic dissemination agenda is suggested, one that is informed by research about

the diffusion of new technologies, processes, and practices. Technology transfer could be enhanced by targeting mine operators and workers who effectively influence the decisions of others. The Mining Program should also develop demonstration projects that show the feasibility and effectiveness of interventions to address or reduce an illness or a detrimental situation.

Targeting New Research

The Mining Program is addressing needs in the future through new research areas such as chemical hazards and improved communications and training, as well as expanded research in noise prevention, surveillance, and repetitive injury prevention. The program must be able to respond quickly to immediate critical needs as well as pursue paradigm-changing research to reduce health and safety risks.

BOX 1 Five-Point Scales Used for the Rating of Relevance and Impact

Rating of Relevance

- 5** = Research is in highest-priority subject areas and highly relevant to improvements in workplace protection; research results in, and NIOSH is engaged in, transfer activities at a significant level (highest rating).
- 4** = Research is in high-priority subject area and adequately connected to improvements in workplace protection; research results in, and NIOSH is engaged in, transfer activities.
- 3** = Research focuses on lesser priorities and is loosely or only indirectly connected to workplace protection; NIOSH is not significantly involved in transfer activities.
- 2** = Research program is not well integrated or well focused on priorities and is not clearly connected to workplace protection and inadequately connected to transfer activities.
- 1** = Research in the research program is an ad hoc collection of projects, is not integrated into a program, and is not likely to improve workplace safety or health.

Rating of Impact

- 5** = Research program has made a major contribution to worker health and safety on the basis of end outcomes or well-accepted intermediate outcomes.
- 4** = Research program has made a moderate contribution on the basis of end outcomes or well-accepted intermediate outcomes; research program generated important new knowledge and is engaged in transfer activities, but well-accepted intermediate outcomes or end outcomes have not been documented.
- 3** = Research program activities or outputs are going on and are likely to produce improvements in worker health and safety (with explanation of why not rated higher).
- 2** = Research program activities or outputs are going on and may result in new knowledge or technology, but only limited application is expected.
- 1** = Research activities and outputs are NOT likely to have any application.

NA = Impact cannot be assessed; program not mature enough.

Emerging Issues

The Mining Program should stay aware of pertinent current and emerging research, and be prepared to act on potential health and safety issues. To determine future research areas, the Mining Program should continue to work with industry, organized labor, Mine Safety and Health Administration, academia, and international partners. Specifically, the report recommends that NIOSH:

- Be prepared to deal with issues associated with increased remote control and automated equipment and systems.
- Address the health effects of mixed exposures, such as diesel exhaust, hydrocarbons, and noise, as well as the combined effects of mixed noise (continuous and impulse-impact) environments.

- Consider the extent and effects of radon and radiation exposure in the presence of other potential chemical agents as the United States increases its reliance on nuclear energy.
- Attend to workforce replacement issues expected within its own organization in the short term to ensure a supply of capable researchers as its older researchers retire.



Photo courtesy Edward Thimons, NIOSH

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This report brief was prepared by the National Research Council based on the committee's report. For more information, contact the Board on Earth Sciences and Resources at (202) 334-2744 or visit <http://dels.nas.edu/besr>. Copies of Mining Safety and Health Research at NIOSH are available from the National Academies Press, 500 Fifth Street, N.W., Washington, DC 20001; (800) 624-6242; www.nap.edu.



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