United States Government Accountability Office

Report to Congressional Requesters

April 2014

MINE SAFETY

Basis for Proposed Exposure Limit on Respirable Coal Mine Dust and Possible Approaches for Lowering Dust Levels

GAO-14-345

April 2014

MINE SAFETY

Basis for Proposed Exposure Limit on Respirable Coal Mine Dust and Possible Approaches for Lowering Dust Levels

GAO Highlights

Highlights of GAO-14-345, a report to congressional requesters

Why GAO Did This Study

Underground coal miners face the threat of being overexposed to coal mine dust, which can cause CWP and other lung diseases, collectively referred to as black lung disease. In October 2010, MSHA—the federal agency responsible for setting and enforcing mine safety and health standards—proposed lowering the exposure limit for respirable coal mine dust to reduce miners' risk of contracting black lung. In August 2012, GAO reported that the evidence MSHA used supported its conclusion that lowering the exposure limit on coal mine dust would reduce miners' risk of disease. However, some have questioned whether and how recent NIOSH trend data on CWP were used in developing the proposed limit.

In May 2013, GAO was asked to provide additional information on MSHA's proposal. GAO examined (1) the extent to which MSHA used recent CWP trend data as a basis for its proposed exposure limit, and (2) expert views on ways to lower the level of dust in coal mines, including their associated advantages, disadvantages, and cost. GAO reviewed MSHA's proposal and related documents; updated a previous GAO literature search; interviewed MSHA and NIOSH officials; and, with the help of the National Academies, convened a group of experts knowledgeable about underground coal mining and methods for reducing coal mine dust. GAO is not making any recommendations in this report, and MSHA and NIOSH both generally concurred with the findings.

View GAO-14-345. For more information, contact Revae Moran at (202) 512-7215 or moranr@gao.gov

What GAO Found

The Department of Labor's Mine Safety and Health Administration (MSHA) appropriately did not use recent trend data on coal workers' pneumoconiosis (CWP) as a basis for its proposal to lower the permissible exposure limit for respirable coal mine dust. These recent data from the Department of Health and Human Services' National Institute for Occupational Safety and Health (NIOSH) are inappropriate for this purpose because they do not include the types of detailed information about individual miners needed to estimate the likelihood that miners would develop CWP at different exposure levels, such as historical dust exposures. MSHA primarily based its proposed new limit on two reports and six epidemiologic studies, which each concluded that lowering the limit on exposure to coal mine dust would reduce miners' risk of developing disease. MSHA's proposed coal mine dust limit was supported by these reports and studies because, unlike recent CWP trend data, they included information needed to conduct a reliable epidemiological analysis of disease risks associated with different levels of exposure to coal mine dust.

Experts identified various approaches that could incrementally reduce overall coal mine dust levels as well as individual miners' exposure to dust. They said that air and water are the primary engineering controls used to reduce overall coal mine dust levels in the mine environment, which are used in various mining equipment, such as sprays. The experts also said that no one technology or approach would result in substantially lower dust levels, but instead could have a cumulative impact if used together. They also noted that all the approaches may not be effective in all types of mines, and that there are a number of cost drivers that would have to be considered, such as machine maintenance and training. The experts also identified other approaches, such as personal protective equipment and administrative controls, which could reduce individual miners' exposure to dust. Personal protective equipment includes respirators and air stream helmets; administrative controls include rotating workers and using remote control devices. However, they noted that these approaches would not help mine operators comply with MSHA's exposure limit because they would not reduce the overall level of coal mine dust in the mine environment.

Miner Using Water Spray to Control Coal Dust

Source: www.CDC.gov.

Contents

Abbreviations

CWP	coal workers' pneumoconiosis
DOL	Department of Labor
mg/m^3	milligrams of dust per cubic meter of air
Mine Act	Federal Mine Safety and Health Act of 1977
MSHA	Mine Safety and Health Administration
NIOSH	Department of Health and Human Services' National Institute for Occupational Safety and Health

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

April 9, 2014

The Honorable Harold Rogers
Chairman
Committee on Appropriations
House of Representatives

The Honorable Jack Kingston
Chairman
Subcommittee on Labor, Health and Human Services, Education and Related Agencies
Committee on Appropriations
House of Representatives

Coal mine dust is one of the most serious occupational hazards in the coal mining industry, and overexposure can cause coal workers' pneumoconiosis (CWP) and a number of other lung diseases collectively referred to as black lung disease.[1] CWP has been the underlying or contributing cause of death for more than 75,000 coal miners since 1968, according to the Department of Health and Human Services' National Institute for Occupational Safety and Health (NIOSH), the federal agency responsible for conducting research on work-related diseases and injuries and recommending occupational safety and health standards. Since 1970, the federal government has paid more than $45 billion in benefits to miners totally disabled by respiratory diseases (or to their survivors), including CWP, through the Black Lung Benefits Program.

In October 2010, the Department of Labor's (DOL) Mine Safety and Health Administration (MSHA)—the federal agency responsible for setting and enforcing mine safety and health standards—proposed lowering the existing concentration limit[2] for respirable coal mine dust from 2.0

[1] In this report, we use the term coal mine dust to refer to respirable coal mine dust produced during the mining process in underground coal mines. Black lung disease is a term that includes CWP and other chronic respiratory or pulmonary impairments resulting from employment in coal mines.

[2] In this report, we use the term exposure limit to refer to the concentration limit set by MSHA for respirable coal mine dust.

milligrams of dust per cubic meter of air (mg/m^3) to 1.0 mg/m^3.[3] In commenting on the proposed rule, representatives of the coal mining industry raised concerns about the feasibility and cost of reducing respirable coal mine dust concentrations to the proposed limit of 1.0 mg/m^3, particularly at certain types of mines. The Consolidated Appropriations Act, 2012, required that GAO review and report on the data collection, sampling methods, and analyses MSHA used to support its proposal.[4] Consistent with this requirement, in August 2012, we issued a report in which we assessed the strengths and limitations of the data and the analytical methods MSHA used to support its proposal to lower the exposure limit for coal mine dust.[5] In that report, we concluded that the evidence MSHA used supported its conclusion that lowering the exposure limit as proposed would reduce miners' risk of disease.

In May 2013, you requested that we conduct an additional analysis of the data MSHA used to support its proposal and provide information on existing technologies that could be used to reduce dust levels in coal mines. In this report, we address the following questions:

1. To what extent did MSHA use recent CWP trend data as a basis for its proposed exposure limit on coal mine dust?
2. What are experts' views on ways to lower the level of dust in coal mines, including their associated advantages, disadvantages, and cost?

To determine the extent to which MSHA used recent CWP trend data as a basis for its proposed new limit for exposure to coal mine dust, we reviewed the proposed rule and related documents; reviewed our previous report and underlying analyses; and interviewed MSHA and NIOSH officials. We also updated our previous literature search to identify

[3] Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors, 75 Fed. Reg. 64,412 (Oct. 19, 2010) (to be codified at 30 C.F.R. pts. 70, 71, 72, 75, and 90). As of March 2014, MSHA had not finalized this regulation. Although MSHA's proposed rule includes other provisions, the first objective of this report focuses on MSHA's proposal to lower the limit for exposure to coal mine dust from 2.0 mg/m^3 to 1.0 mg/m^3.

[4] Pub. L. No. 112-74, div. F, tit. I, § 112, 125 Stat. 786, 1064 (2011).

[5] GAO, *Mine Safety: Reports and Key Studies Support the Scientific Conclusions Underlying the Proposed Exposure Limit for Respirable Coal Mine Dust*, GAO-12-832R (Washington, D.C.: August 17, 2012).

any additional recent studies on the prevalence of coal worker respiratory diseases and reviewed additional information on the strengths and limitations of CWP trend data. To gather experts' views on the options that exist to lower the level of dust in coal mines and their associated advantages, disadvantages, and cost, we worked with the National Academies to convene a group of experts that included mine operators, equipment manufacturers, researchers, and other stakeholders.[6] For more details on our scope and methodology, see appendix I. We conducted this performance audit from July 2013 to April 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Inhaling excessive amounts of coal mine dust can cause CWP and other debilitating lung diseases, including chronic obstructive pulmonary disease, which encompasses chronic bronchitis and emphysema. According to NIOSH, it usually takes about 10 to 15 years of exposure to coal mine dust to develop CWP, although cases involving fewer years of exposure have been observed. Once contracted, CWP cannot be cured, making it critical to prevent the development of this disease by limiting miners' exposure to coal mine dust.

MSHA is responsible for protecting miners by enforcing the provisions of the Federal Mine Safety and Health Act of 1977 (Mine Act), as amended.[7] Under this law, MSHA has a number of responsibilities, including setting new safety and health standards and revising existing standards, approving training programs for mine workers, and developing regulations regarding training requirements for rescue teams, among other things.

[6] The National Academies comprises the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council. We worked with staff from the National Research Council to convene our group of experts.

[7] See Pub. L. No. 95-164, 91 Stat. 1290 (codified as amended at 30 U.S.C. §§ 801-965).The Federal Mine Safety and Health Amendments Act of 1977 amended and renamed the Federal Coal Mine Health and Safety Act of 1969 (Coal Act) and established MSHA. The Mine Improvement and New Emergency Response Act of 2006 recently amended the Mine Act. Pub. L. No. 109-236, 120 Stat. 493.

MSHA also conducts periodic inspections of coal mines and, along with coal mine operators, periodically collects samples of coal mine dust to determine compliance with the exposure limit. MSHA set the current exposure limit for coal mine dust at 2.0 mg/m^3.[8] This limit applies to the overall level of dust in the mine environment; specifically, it provides that each mine operator "shall continuously maintain the average concentration of respirable dust in the mine atmosphere during each shift to which each miner in the active workings of each mine is exposed" at or below that level.[9] To measure the level of dust in the mine environment, MSHA requires that mine operators collect samples of dust in specific areas of the mine and for designated occupations. Designated occupations are those that have the greatest concentration of coal mine dust, as determined through MSHA sampling.[10]

When MSHA sets standards for toxic materials or harmful physical agents such as coal mine dust, the Mine Act requires the agency to set standards "which most adequately assure on the basis of the best available evidence that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards…for the period of his working life."[11] In developing a standard, the Mine Act also requires MSHA to consider, among other factors, the feasibility of the standard, and MSHA conducts analyses to determine whether a proposed standard is both economically and technologically feasible.[12] Specific to coal mine dust, the Mine Act further specifies that one of its purposes is to "provide, to the greatest extent possible, that the working conditions in each underground coal mine are sufficiently free of respirable dust concentrations…to permit each miner the opportunity to work underground during the period of his entire adult working life without

[8] The Coal Act set an interim exposure limit for coal mine dust of 3.0 mg/m^3 that went into effect in 1970 and continued until 1972, when the standard of 2.0 mg/m^3 then took effect. Pub. L. No. 91-173, § 202(b), 83 Stat. 742, 760-61 (1970). The 1977 Mine Act did not change the 2.0 mg/m^3 exposure limit, which was to be in effect until superseded by improved standards issued by MSHA. In 1980, via the rulemaking process, MSHA issued the current standard, keeping the exposure limit at 2.0 mg/m^3. 45 Fed. Reg. 23,990, 24,001 (Apr. 8, 1980) (codified at 30 C.F.R. § 70.100).

[9] 30 C.F.R. § 70.100(a).

[10] 30 C.F.R. §§ 70.2, 70.207, 70.208.

[11] 30 U.S.C. § 811(a)(6)(A).

[12] See *Nat'l Mining Ass'n v. Sec'y of Labor*, 153 F.3d 1264, 1269 (11th Cir. 1998).

incurring any disability from…[an] occupation-related disease during or at the end of such period."[13]

NIOSH shares some responsibility with MSHA for improving mine safety and protecting miners' health. For example, NIOSH conducts research on the causes of work-related diseases and injuries; researches, develops, and tests new technologies and equipment designed to improve mine safety; and recommends occupational safety and health standards, such as the exposure limit for coal mine dust. NIOSH also administers the Coal Workers' X-ray Surveillance Program—a medical monitoring and surveillance program designed to detect and prevent lung disease.[14] This program requires mine operators to provide up to three initial chest x-rays for coal miners within specified time frames after their employment begins. Miners then can opt to have periodic chest x-rays approximately every 5 years thereafter. NIOSH uses this program for disease surveillance, which includes tracking trends, setting prevention and intervention priorities, and assessing prevention and intervention efforts. In addition, to estimate the prevalence of lung disease among underground coal miners and to study the relationship between miners' lung disease and their level of exposure to coal mine dust, NIOSH developed the National Study of Coal Workers' Pneumoconiosis. In this study, NIOSH collected and analyzed epidemiological data—including findings from chest x-rays, results of lung function tests, and occupational and smoking histories—from a sample of coal miners across all major coalfields in the United States between 1969 and 1988. The data also allowed researchers to link to results of coal mine dust sampling over approximately the same period to estimate dust exposures for individual miners. According to NIOSH, epidemiological studies examining the relationship between coal mine dust and disease must contain a sufficiently large body of data over a time period that is adequate to derive reliable findings.

There are two primary types of underground coal mining in the United States: continuous mining and longwall mining. In continuous mining, a

[13] 30 U.S.C. § 841(b).

[14] This program is part of NIOSH's Coal Workers' Health Surveillance Program, carried out pursuant to requirements of the Mine Act and NIOSH regulations. 30 U.S.C. § 843; 42 C.F.R. §§ 37.1 - 37.80. Hereafter, we refer to data collected by this program as surveillance data.

machine called a continuous miner cuts out rooms of coal from the coal bed leaving a series of pillars of coal to help support the mine roof. In addition to the pillars of coal, bolts are driven into the roof of the mine to help support the mine. The extracted coal from the continuous miner is loaded into shuttle cars for transport out of the mine. In longwall mining, a machine called a shearer moves back and forth across a wall of coal. After the coal is cut, a machine crushes it into small pieces and a conveyer belt removes it from the mine. While the shearer cuts the coal and the coal is extracted, the roof is held up temporarily with self-advancing hydraulic supports. While both types of mining produce dust, certain pieces of machinery produce more coal mine dust than others. For example, in continuous mining, the continuous miner, roof bolting machines, and shuttle cars generate the most dust. Major sources of dust in longwall mining include the shearer and crusher.

MSHA Did Not Use Recent CWP Trend Data as a Basis for Its Proposed Exposure Limit on Coal Mine Dust, Which Was Appropriate

Appropriately, MSHA did not use NIOSH's surveillance data as the basis for its proposed new coal mine dust limit, although the data served to inform MSHA's decision to take action. In the preamble to its proposed rule, MSHA cited an increase in the prevalence of CWP among underground coal miners based on NIOSH surveillance data, which may have led many to believe that these data were part of the basis for MSHA's proposed change in the exposure limit. The surveillance data showed that the prevalence of CWP, which declined substantially between 1970 and the late 1990s, increased for several years in the early 2000s before declining again between 2005 and 2009. According to MSHA and NIOSH officials, information about the increasing prevalence of CWP based on the surveillance data was mentioned in the preamble to the proposed rule to show that black lung disease still exists among active underground coal miners, thus helping to compel MSHA to take action to reduce miners' exposure to dust, in accordance with its duties under the Mine Act. However, as we reported in August 2012, the data MSHA used to support its proposal were from two reports, which relied on six epidemiological studies, not the surveillance data.[15] In addition, in a 1996 notice in the Federal Register, well before the increase in the prevalence of CWP shown by the surveillance data, MSHA stated its

[15] GAO, *Mine Safety: Reports and Key Studies Support the Scientific Conclusions Underlying the Proposed Exposure Limit for Respirable Coal Mine Dust,* GAO-12-832R (Washington, D.C.: August 17, 2012).

intent to respond to a 1995 NIOSH recommendation to lower the exposure limit for coal mine dust by developing a proposed rule.[16]

In our August 2012 report we noted that MSHA primarily relied on two reports to develop its proposed exposure limit: its 2010 Quantitative Risk Assessment in Support of the Proposed Respirable Coal Mine Dust Rule and NIOSH's 1995 Criteria for a Recommended Standard—Occupational Exposure to Respirable Coal Mine Dust.[17] These reports were based on six key epidemiologic studies that relied on data from NIOSH's National Study of Coal Workers' Pneumoconiosis.[18] These epidemiological studies examined the disease risk associated with cumulative dust exposure, while accounting for other relevant factors such as the age and smoking history of each miner. The studies found that cumulative exposure to coal mine dust over a working life at the current exposure limit was associated with adverse health outcomes, including CWP. Each of these studies concluded that lowering the exposure limit would reduce coal miners' risk of developing disease. However, the studies also concluded that, even if coal mine dust concentrations were successfully reduced to the proposed exposure limit of 1.0 mg/m^3, miners would still be at some risk of developing disease.[19]

It would not have been appropriate for MSHA to use NIOSH's surveillance data in developing its proposed exposure limit for coal mine

[16] Response to National Institute for Occupational Safety and Health (NIOSH) Criteria Document, 61 Fed. Reg. 18,308 (Apr. 25, 1996).

[17] MSHA also relied on the 1996 *Report of the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers*, but it contained no new information or analyses of the relationship between coal mine dust exposure and its associated health effects.

[18] One study relied on an examination of autopsied miners' lungs and data on work history, smoking, race, and age at death obtained from medical records and questionnaires completed by miners' next of kin.

[19] According to NIOSH, the goal of its recommendation to lower the exposure limit was to minimize, to the greatest extent possible, the health risks associated with a miner's exposure to coal mine dust. In making this recommendation, NIOSH took into account an evaluation of data on health effects and the feasibility of collecting and analyzing dust samples. NIOSH also considered the technological feasibility of controlling exposures. Specifically, NIOSH determined that the recommended exposure limit of 1.0 mg/m^3 would have clear beneficial health effects for all miners. At the time that NIOSH's 1995 Criteria for a Recommended Standard was published, however, an exposure limit lower than 1.0 mg/m^3 was not considered to be technologically feasible.

dust because of some important limitations of the data. For example, because the data do not include individual miners' past exposures to coal mine dust, they cannot be used to estimate disease risk for individual miners. Based on principles of epidemiology and statistical modeling, measures of past exposures to coal mine dust are critical to assessing the relationship between miners' cumulative coal mine dust exposure and their risk of developing CWP. Also, because there is no active selection of miners by researchers and participation in the surveillance program is voluntary, miners who choose to participate may differ in unknown ways from those who choose not to participate, which could result in an overestimation or underestimation of the prevalence of disease. This methodological limitation is known as participation bias, and there are many ways it could affect the prevalence of disease indicated by the surveillance data. For example, the prevalence of CWP could be underestimated because some miners may decline further x-ray screenings once CWP is detected.[20] Alternatively, the prevalence of CWP could be overestimated because miners may be more likely to participate after years of dust exposure, when they believe they are at risk of developing CWP.

Experts Identified Various Approaches that Could Reduce Overall Coal Mine Dust Levels, as Well as Individual Miners' Exposure to Dust

[20] NIOSH researchers explored the impact of some types of biases, including the possibility that miners would decline further x-ray screenings once CWP has been detected. They found that this and several other possible biases did not likely seriously undermine the use of the surveillance data for measuring prevalence of disease. See A. S. Laney and M. D. Attfield, "Examination of Potential Sources of Bias in the US Coal Workers' Health Surveillance Program," *American Journal of Public Health*, vol. 104, no. 1 (2014).

Experts Identified Various Engineering Controls That Could Help Reduce Overall Coal Mine Dust Levels

Experts identified various engineering controls that could further reduce the overall level of coal mine dust, but they said reductions would likely be incremental.[21] Since 1968, the mining industry has achieved significant reductions in the level of dust in underground coal mines. Average dust levels declined from about 7 mg/m^3 in 1968 to below 2 mg/m^3 in recent years. The experts also said that no one control would result in substantially lower dust levels, but that the cumulative impact of a number of approaches could further reduce dust levels. Currently, dust is controlled in the mine environment primarily through the use of air and water. In general, air is used to dilute the concentration of coal dust in the air, and to move coal dust away from workers. In addition, dust is removed from the air through the use of air filters and other devices that capture dust. Water sprays are used to reduce the amount of dust generated and to move dust away from workers.

According to the experts who participated in our panel, operators employ a number of technologies that use air to reduce the amount of coal mine dust in the mine atmosphere. For example, in continuous mining operations, air scrubbers can be an effective method of lowering dust concentrations. Scrubbers, which can be mounted on a continuous mining machine, run dust-laden air through a wet filter that collects dust, and remove a substantial amount of dust from the atmosphere. According to one expert, NIOSH is developing a stand-alone scrubber that can be placed at different locations in the mine to filter the air for workers in those areas, and preliminary tests have found it to be about 90 percent efficient at removing dust. NIOSH is also developing a device called a canopy air curtain, which filters air from the mine environment and provides this filtered air to miners who secure the roof (roof bolters) once coal is extracted by the continuous mining machine. Tests by NIOSH show that the canopy air curtain reduces the amount of dust that roof bolters are exposed to by about half. Mine operators also use enclosures, curtains, and vacuums to control where the dust goes to keep it away from workers' breathing zones. Since mines also need to ensure that noxious gas levels remain low, operators use ventilation systems that constantly

[21] To obtain the views of experts, with the assistance of the National Academies, we convened a panel of 16 experts, including academics; representatives of the coal industry and miners; and government officials, and asked them about approaches for reducing coal mine dust. For more details on the methodology we used to obtain the experts' views, see appendix I.

replace contaminated air with fresh air, which also helps reduce the level of coal mine dust in the air.

The experts also described ways that operators use water to prevent dust from being generated in mining operations. For example, operators spray water on the surface of the coal and on the machines' cutting surfaces as the coal is being cut to reduce the amount of dust generated. In some cases, operators also infuse water into the coal prior to cutting, but the experts reported limited success with that approach. Operators also use hygroscopic salts on mine floors to help maintain the moisture content of the mine floor, which in turn absorbs coal mine dust. The experts said that, with the increased productivity of mines in recent years, the water quantity and pressure for sprays may need to be increased. From 1978 to 2007, the amount of coal produced per work hour has more than tripled. The experts cautioned, however, that using too much water could have adverse impacts, such as causing conveyor belts to slip, which would affect production.

The experts pointed to a number of factors that could limit mine operators' use of engineering controls aimed at reducing coal mine dust in the mine environment. The experts said that fundamental differences between continuous mining and longwall mining operations render some technological approaches useful for one type of mining, but not both. For example, while scrubbers were cited as an effective tool for reducing dust in continuous mining operations, the experts cautioned that they may not be as effective for mines that require a lot of ventilation, such as longwall mines, because the amount of air flowing through the mine can overwhelm the scrubber. An expert noted that one way to reduce dust levels is to operate only one continuous mining machine at a time in a section of a mine instead of more than one. However, he estimated that this could significantly decrease the productivity of the mine and increase the cost of producing the coal. Another expert noted that controlling dust in a cost-effective manner requires some flexibility.

The experts did not quantify the cost of some of the technologies used in reducing dust levels because dust control is not the only purpose of some of the technologies, and future technologies have not been developed enough to fully determine their costs. However, they did identify primary cost drivers. For example, mines that contain high levels of gas must ventilate significant amounts of fresh air, which also helps lower coal mine dust levels. They also noted that while NIOSH has done some of the major research on dust control, overall, industry research on dust control technologies has declined. One expert made the point that research is

directly proportional to the economic health of the coal industry. When the industry is contracting economically, manufacturers may not be willing to devote resources to research and development. While specific costs were difficult to assign, the primary drivers the experts identified for lowering dust levels were the cost of maintaining equipment; the cost of purchasing new or additional equipment, materials, and labor; and the cost of providing training.

Experts Noted Options That Could Reduce Individual Miners' Exposure to Dust

The experts identified options that could reduce individual miners' exposure to respirable coal mine dust, specifically, personal protective equipment and administrative controls. However, they noted that these options would not help mines reduce the overall level of coal mine dust in the mine environment, and therefore would not help mine operators comply with MSHA's exposure limit. Personal protective equipment includes items such as respirators and air stream helmets. Respirators filter the air that an individual miner breathes and air stream helmets actively filter and push air across a miner's face. While respirators and air stream helmets could reduce the amount of coal dust to which individual miners are exposed, the experts noted that miners have concerns that these devices limit communication between miners and thus could raise safety issues.[22] The experts also said that personal dust monitors could be used to reduce individual miners' exposure to dust because they provide workers with real time data on dust levels in the area of the mine in which they are working. This information allows workers to adjust their position in the mine to reduce their exposure to coal mine dust. Although personal dust monitors have no effect on dust levels in the mine, the experts noted that they may provide data that could be used by mine operators to identify problem areas in the mines and to change work practices to reduce miners' exposure to coal mine dust. One of the experts told us personal dust monitors cost about $13,000 to $18,000 per unit, which could be a significant expense if all miners were outfitted with them.

The experts also noted that administrative controls could limit miners' exposure to coal mine dust, although they do not control the overall level

[22]The Mine Act requires that approved respiratory equipment be made available to anyone exposed to concentrations of coal mine dust in excess of the permissible exposure limit; however, the use of respirators "shall not be substituted for environmental control measures in the active workings" of the mine. 30 U.S.C. § 842(h).

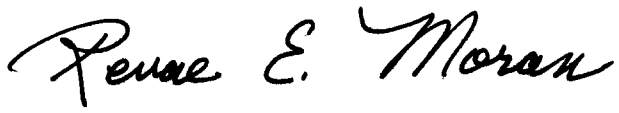
of dust in the mine. These controls include rotating workers more frequently from positions that are exposed to higher levels of dust, cutting the coal using a remote control device, and changing the sequence by which coal is cut. Experts said that rotating workers to other positions could help reduce their exposure to dust, but this could also require changes to the current collective bargaining agreement at unionized mines because the jobs that involve highest exposure to dust may also pay more. This approach may also increase costs for mine operators because, for example, the collective bargaining agreement might require them to continue to pay workers a higher rate of pay when they rotate to a lower paying position. The experts also said that some mines use remote control devices to keep miners farther away from the source of dust. Controlling the mining machine from a greater distance than is currently done may require high resolution imaging equipment. One expert said that this is especially true for mining operations where geologic conditions change frequently, requiring miners to make judgments about where to move the machinery. According to the experts, another way to limit exposure to individual miners in continuous mining is by modifying the sequence in which coal is mined. The experts explained that this approach reduces the number of miners who are downwind from the dust generated by the continuous mining machine. However, this type of change could result in decreased productivity in the mine.

Agency Comments

We provided a draft of this report to the Secretaries of Labor and Health and Human Services for review and comment. Both agencies generally concurred with the findings of the report, but provided no formal written comments. The agencies did, however, provide technical comments, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees and the Secretaries of Labor and Health and Human Services. In addition, the report is available at no charge on the GAO website at http://www.gao.gov. If you or your staff have any questions about this report, please contact me at (202) 512-7215 or

moranr@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix II.



Revae Moran
Director, Education, Workforce,
and Income Security Issues

List of Requesters

The Honorable Harold Rogers
Chairman
Committee on Appropriations
House of Representatives

The Honorable Jack Kingston
Chairman
Subcommittee on Labor, Health and Human Services, Education and Related Agencies
Committee on Appropriations
House of Representatives

Appendix I: Objectives, Scope, and Methodology

The objectives of our review were to: (1) determine the extent to which the Mine Safety and Health Administration (MSHA) used recent coal workers' pneumoconiosis (CWP) trend data as a basis for its proposed exposure limit on coal mine dust, and (2) obtain experts' views on ways to lower the level of dust in coal mines, including their associated advantages, disadvantages, and cost.

To address our first objective, we reviewed MSHA's Notice of Proposed Rulemaking,[1] including the proposed exposure limit and related documents, updated the literature search from our prior report, and interviewed officials from MSHA and the National Institute for Occupational Safety and Health (NIOSH) to identify recent data on the prevalence of coal worker respiratory diseases. Two GAO research methodologists and one public health specialist reviewed information gathered about CWP trend data, to assess its strengths and limitations, and reviewed a recent study by NIOSH researchers on the usefulness of these data for estimating disease prevalence. We also reviewed our prior report and the analyses that supported it, and interviewed MSHA and NIOSH officials to determine what role, if any, recent CWP trend data had in developing the proposal to lower the exposure limit. We examined whether these data would have been appropriate for MSHA to use in developing its proposed exposure limit using principles of social science research and epidemiology.

For our second objective, we worked with the National Academies to convene a group of experts to obtain their views on these issues.[2] To prepare for our discussions with experts, we reviewed NIOSH and other studies on the ability of currently available and alternative technologies to control coal mine dust. We also reviewed the technological and economic feasibility assessments MSHA used to develop its proposed exposure limit. The group included experts from all of the major stakeholder groups: NIOSH researchers, academics, other technical experts, individuals from

[1] Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors, 75 Fed. Reg. 64,412 (Oct. 19, 2010) (to be codified at 30 C.F.R. pts. 70, 71, 72, 75, and 90).

[2] The National Academies have extensive experience identifying experts and convening panels and maintain a membership of the nation's top scientists, engineers, and other professionals. The National Academies comprises the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council. We worked with staff from the National Research Council to convene our group of experts.

companies that manufacture mining equipment, and individuals who represent coal mine operators and workers. In identifying the experts, the National Academies compiled a preliminary list of 53 experts who represented 17 universities, 7 coal companies or coal associations, 5 equipment manufacturers, 1 mine workers' association, and 2 government agencies. The nominees were grouped by sector and field of expertise, and were vetted by 10 individuals working in the public, private, and academic sectors who have expertise in coal mining or a related field. Feedback from these individuals, along with biographical information about the experts, was used to prioritize the experts within each sector and field of expertise. Using this information, we invited 17 experts to participate in a 1-day panel discussion, although 1 person subsequently cancelled. The resulting 16 experts included 3 representatives of mine operators, 1 representative of underground coal miners, 3 representatives of equipment manufacturers, 6 academics, and 3 representatives of federal government agencies.[3]

To ensure that there were no unforseen biases or conflicts of interest, each panelist reported to the National Academies his or her investments, sources of earned income, organizational positions, relationships, and other circumstances that could affect, or could be viewed to affect, his or her view on the topic of methods for reducing the level of respirable dust in underground coal mines. We asked the experts to discuss the technological and other options available for lowering the level of dust in coal mines below the existing permissible exposure limit and the costs, advantages, and disadvantages of these technologies. We did not ask the experts about the proposed new limit. In addition to the 16 panelists, we allowed 5 observers to sit in on the panel discussion. The observers included representatives of mining equipment manufacturers, coal mine operators, and one government agency.

We conducted this performance audit from July 2013 to April 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[3] One representative was a retired agency official.

Appendix II: GAO Contacts and Staff Acknowledgments

Contact

Revae Moran, (202) 512-7215 or moranr@gao.gov.

Staff Acknowledgments

In addition to the contact listed above, individuals making key contributions to this report were Mary Crenshaw (Assistant Director), Nabajyoti Barkakati, Russell Burnett, Sarah Cornetto, Andrea Dawson, Timothy Guinane, Kristy Kennedy, Kathy Leslie, Sheila McCoy, Sara Pelton, Tim Persons, Martin Scire, Sushil Sharma, Walter Vance, Kathleen van Gelder, and Shana Wallace.