

U.S. Department of Labor

Office of Inspector General—Office of Audit

**REPORT TO THE MINE SAFETY
AND HEALTH ADMINISTRATION**



**MSHA NEEDS TO IMPROVE EFFORTS
TO PROTECT COAL MINERS FROM
RESPIRABLE CRYSTALLINE SILICA**

**DATE ISSUED: NOVEMBER 12, 2020
REPORT NUMBER: 05-21-001-06-001**



BRIEFLY...

MSHA NEEDS TO IMPROVE EFFORTS TO PROTECT COAL MINERS FROM RESPIRABLE CRYSTALLINE SILICA

November 12, 2020

WHY OIG CONDUCTED THE AUDIT

More than three times as many coal miners were identified as having black lung disease from 2010 to 2014 compared to 1995 to 1999. The evidence indicates respirable crystalline silica may be responsible for this increase. The Federal Mine Safety and Health Act of 1977 (MINE Act) requires MSHA to set standards based on the best available evidence to protect miners from exposure to toxic materials or harmful agents. However, over the past four decades, various stakeholders have raised concerns about exposures to respirable crystalline silica – a carcinogen and contributing cause of black lung disease – in coal mines.

WHAT OIG DID

We conducted this audit to determine the following:

Has MSHA sufficiently protected coal miners from exposure to respirable crystalline silica?

To answer this question, we interviewed MSHA officials, subject matter experts, and representatives of other government agencies whose research and recommendations have been used to set respirable crystalline silica standards, among others. Our work also included reviewing regulations, studies, and MSHA data.

READ THE FULL REPORT

<http://www.oig.dol.gov/public/reports/oa/2021/05-21-001-06-001.pdf>

WHAT OIG FOUND

MSHA has not sufficiently protected coal miners from exposure to respirable crystalline silica. MSHA's current silica exposure limit is out of date, MSHA cannot cite and fine mine operators for excess silica exposures alone, and MSHA's sampling for silica may be too infrequent to be sufficiently protective.

MSHA's silica exposure limit is out of date. A significant body of evidence shows that lowering the silica limit would be a major factor in preventing coal workers' deaths and illnesses caused by silica exposure. Even though MSHA has known its silica limit did not align with current scientific recommended limits, it continued to maintain essentially the same silica limit established in the 1960s. As a result, workers in coal mines with silica levels above recommended limits continue to be at risk of developing life-threatening health problems.

MSHA cannot issue fines for excess silica exposures alone. Instead, MSHA's exposure limit for silica is tied to its exposure limit for respirable coal mine dust. Thus, violating MSHA's silica limit alone but not its coal dust limit, does not result in a citation or fine to deter future violations. A separate standard for silica would allow MSHA to issue citations and monetary penalties for violating its silica limit to better protect miners from this toxic mineral.

MSHA's silica sampling protocols may be too infrequent to be sufficiently protective. Since MSHA is required by the MINE Act to inspect underground coal mines quarterly and surface mines semiannually, MSHA only sampled mines for silica levels during these periodic inspections. However, silica levels fluctuate frequently. Changes in geology and movement of personnel within mines mean that miners' exposure to silica may change on a daily, if not hourly basis.

WHAT OIG RECOMMENDED

We made three recommendations to the Assistant Secretary for Mine Safety and Health.

The Assistant Secretary did not fully agree with our recommendations, but indicated MSHA will take corrective actions to address them.

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INSPECTOR GENERAL'S REPORT

November 12, 2020

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This report presents the Office of Inspector General's (OIG) audit of the Mine Safety and Health Administration's (MSHA) actions to protect U.S. coal miners from exposure to respirable crystalline silica, hereafter referred to as silica.¹ MSHA is responsible for setting standards based on the best available evidence to protect miners from exposure to toxic materials or harmful agents, as provided under the Federal Mine Safety and Health Act of 1977 (MINE Act).² However, over the past four decades, various stakeholders have raised concerns about the allowable limits for silica – a carcinogen and contributing cause of black lung disease – in coal mines. For example, more than three times as many coal miners were identified as having black lung disease from 2010 to 2014 compared to 1995 to 1999. The evidence indicates silica may be responsible for the increase.

Therefore, we conducted this audit to determine the following:

Has MSHA sufficiently protected coal miners from exposure to respirable crystalline silica?

¹ Silica is largely made up of quartz. In this report, the term "silica" will refer to both silica and quartz.

² Pub. L. No. 95-164 (Nov. 9, 1977), as amended [30 U.S.C. §§ 801 et seq.]. The MINE Act established MSHA. The current coal standards, which relate to silica (quartz), are found at 30 C.F.R. Section 70.101.

We found that MSHA has not sufficiently protected coal miners from exposure to respirable silica. MSHA could decrease coal miners' risk of exposure to silica by updating its regulations to establish a separate, lower limit permitted for silica that is not tied to coal dust, issuing citations and fines to deter violations, and increasing the frequency of its silica testing in coal mines.

To answer this question, we interviewed MSHA officials and various stakeholders, including subject matter experts and representatives of other government agencies whose research and recommendations have been used to set silica standards. We also reviewed laws, regulations, policies, proposed and recommended regulations, studies, reports and MSHA data. Our audit covered MSHA's silica standards from the 1960s to 2020, and MSHA's coal mine data from 1990 through 2019.

BACKGROUND

Extracting, processing, and transporting coal generates significant amounts of coal dust, of which silica is a component. While exposure to coal dust can impair miners' health, silica is classified as a carcinogen and is significantly more harmful. Silica exposure can cause lung diseases, such as coal workers' pneumoconiosis (also known as black lung disease) and silicosis. Both are debilitating and shorten life expectancy. According to MSHA, more than 76,000 miners have died from black lung disease since 1968, including over 6,400 between 2004 and 2014.

The National Institute for Occupational Safety and Health (NIOSH),³ the federal agency responsible for recommending limits to protect the health of workers from exposure to toxic materials and harmful agents, found the number of U.S. coal miners with black lung disease has been rising since the 2000s after two decades of decline. Using radiographic data collected from active coal miners during 1970 to 2017 who voluntarily participated in its Coal Workers' Health Surveillance Program (CWHSP),⁴ NIOSH found the following:

- More than 30 percent of underground coal miners with 25 or more years of mining tenure had black lung disease by the mid-1970s.

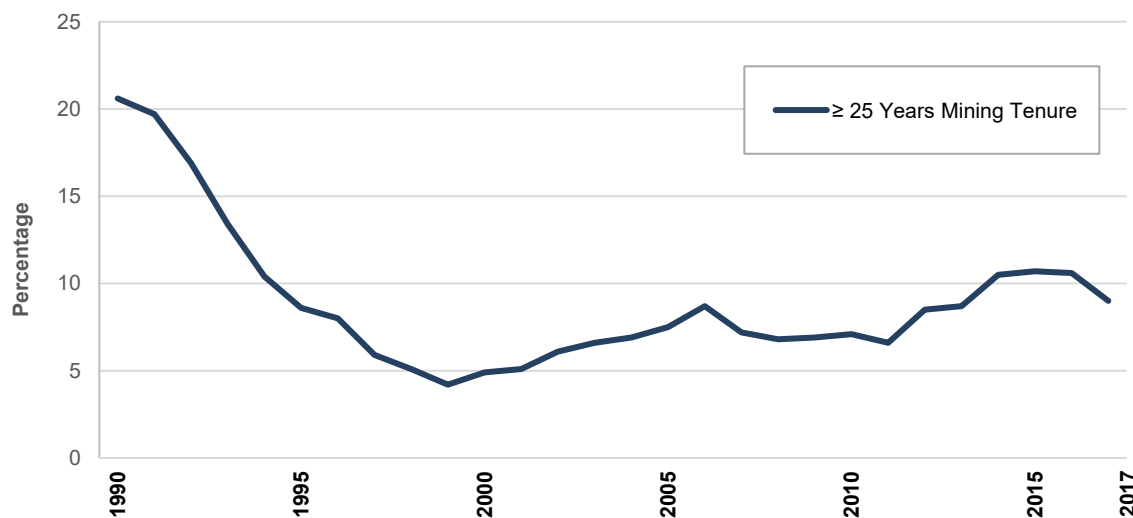
³ NIOSH is part of the U.S. Centers for Disease Control and Prevention (CDC), in the Department of Health and Human Services.

⁴ NIOSH administers the CWHSP, which offers periodic lung function testing, respiratory health assessment questionnaires, and extended health surveillance for surface, underground, and contract coal miners. Participation by coal miners in the CWHSP is voluntary.

- The number of coal miners with black lung disease, which had dropped to a low of about 5 percent in the late 1990s, had started increasing thereafter.

In 2018, NIOSH indicated that only about 35 percent of active coal miners participated in the CWHSP.⁵ In addition, the data did not include surface coal miners. In 2020, surface mines accounted for at least 48 percent of all active coal mines in the U.S.⁶ Therefore, due to low participation in the CWHSP health screening, the trends shown in Figure 1 below may not be representative of the coal mine work force as a whole and the total number of coal miners with black lung disease or other illnesses related to silica exposure may be underreported.

FIGURE 1: PERCENTAGE OF EXAMINED COAL MINERS WITH BLACK LUNG DISEASE (1990-2017)*



Source: NIOSH CWSHP data on coal miners. See Exhibit 1 for more details.

* This data only represents about 35 percent of active underground coal miners who volunteered for health screenings and excludes surface coal miners since NIOSH did not start collecting data on them until 2014.

According to MSHA, even coal miners with short working tenures are at risk if their exposures to silica are high.⁷ Recent studies found large clusters of miners with less than 20 years of mining tenure in Kentucky, West Virginia, and Virginia with progressive massive fibrosis (PMF), the most severe form of black lung disease. Among other reasons, some researchers have attributed the increase

⁵ CDC, Request for Information, *Barriers to Participation in the NIOSH Coal Workers Health Surveillance Program*, 83 FR 56327 (November 2018).

⁶ According to MSHA’s Mine Data Retrieval System, there were 668 active coal mines – 145 underground, 321 surface, and 202 facility – in the U.S. as of September 2020.

⁷ MSHA, transcript of MSHA’s public meeting with stakeholders on Request for Information on Respirable Silica (October 17, 2019).

and prevalence of PMF in these miners to high-volume mechanized mining of decreasing deposits of coal, which releases more silica dust.

The current exposure limit for silica in coal mines established more than 50 years ago in the Federal Coal Mine Health and Safety Act of 1969 (Coal Act) is tied to MSHA's limit for coal dust.⁸ MSHA's silica exposure limit for coal mines is 100 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$). Further, MSHA cannot cite mine operators for excessive silica levels alone. To cite mines for excess silica levels alone, MSHA would have to establish a separate lower limit not tied to coal dust by creating a new regulation. The agency currently regulates silica exposures by periodically measuring silica levels in mines. When this monitoring detects silica levels above MSHA's exposure limit, MSHA requires the mine to implement a reduced dust standard to reduce overall coal dust levels (of which silica is a component) and reviews the mine's respirable dust controls for revision and/or continued approval. Then, when mines exceed the reduced dust standard, MSHA can issue citations. This method of regulating silica levels assumes that reducing overall dust levels will reduce silica levels.

RESULTS

MSHA has not sufficiently protected coal miners from exposure to respirable silica. Specifically, we found the following:

- MSHA's silica exposure limit for coal mines is out of date;
- MSHA cannot cite or fine mine operators for excess silica exposures; and
- MSHA's silica sampling protocols may be too infrequent to be sufficiently protective.

MSHA needs to update its regulations to adopt a lower legal limit for silica and establish a separate standard that results in a citation and monetary penalty to help deter violations. MSHA also needs to increase the frequency of its own sampling to ensure that miners are not unnecessarily exposed to unsafe levels of silica in coal mines.

A significant body of evidence shows that lowering MSHA's current silica limit would be a major factor in preventing coal workers' deaths and illnesses caused by silica exposures. Even though MSHA has known its silica limit did not align

⁸ Pub. L. No. 91-173 (Dec. 30, 1969). The MINE Act amended the Coal Act.

with current recommended standards, it has continued to maintain essentially the same silica limit established in the 1960s.

MSHA'S SILICA EXPOSURE LIMIT IS OUT OF DATE

Since MSHA's legal silica exposure limit in coal mines was established in 1969, various scientific and standard setting organizations have recommended and adopted significantly lower exposure limits based on ongoing research. Nevertheless, MSHA's limit has remained unchanged for over 50 years. This limit was originally based on a formula prescribed by the Department of Health and Human Services (HHS) and a level the American Conference of Governmental Industrial Hygienists (ACGIH) proposed in the 1960s and which the ACGIH has since lowered by 75 percent.⁹ Nonetheless, MSHA has not changed its legal exposure limit.

MSHA'S SILICA EXPOSURE LIMIT DOES NOT ALIGN WITH CURRENT SCIENTIFIC EVIDENCE

The MINE Act requires MSHA to set standards that must ensure, on the basis of the best available evidence, that no miner will suffer material impairment of health or functional capacity from exposure to toxic materials or harmful agents.¹⁰ MSHA's silica exposure limit for coal mines of 100 µg/m³ was established in 1969 and is tied to the limit of respirable coal dust and not separate.

Over the following decades, various stakeholders, including scientific and standard-setting organizations such as the ACGIH, found the silica exposure limit MSHA had in place did not sufficiently protect workers' health as follows:

- *ACGIH*. In 1968, the ACGIH estimated workers could be exposed to daily silica levels up to approximately 100 µg/m³ without adverse health effects. The ACGIH—a not-for-profit scientific association comprised of industrial hygienists and other occupational health and safety professionals—expresses scientific opinions regarding safe levels of exposure to various workplace hazards without considering economic or technical feasibility. In 2000, the ACGIH reduced its recommendation by half to 50 µg/m³ because it found silica exposure near 100 µg/m³ probably does cause silicosis and lung disease. In 2006, the ACGIH further lowered its limit to 25 µg/m³.

⁹ The Department of Education and Welfare, which is now HHS, originally prescribed the formula.

¹⁰ In 1977, the MINE Act moved responsibility to enforce federal mine safety and health legislation from the Department of the Interior to the newly created MSHA under DOL.

- *NIOSH*. In 1974, NIOSH concluded silica was a workplace hazard and recommended DOL adopt an occupational exposure limit of 50 $\mu\text{g}/\text{m}^3$, half the limit MSHA continues to permit. In 1995, NIOSH once more recommended DOL lower the level, specifically for coal mines, to 50 $\mu\text{g}/\text{m}^3$. NIOSH also emphasized that miners exposed to 50 $\mu\text{g}/\text{m}^3$ were still at risk of developing respiratory diseases and recommended keeping coal miner exposures well below this level. NIOSH reaffirmed its 1995 conclusions in 2011.
- *Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers*. To address NIOSH's 1995 recommendations, the Secretary of Labor established a committee to recommend improving standards to eliminate black lung disease and silicosis. In 1996, among other things, the Advisory Committee recommended MSHA seek input from NIOSH and the Occupational Safety and Health Administration (OSHA) on lowering its permissible silica exposure limit.
- *OSHA*. MSHA's sibling regulatory agency within DOL is responsible for enforcing regulations that establish the legal limits for non-mine workplace exposures to toxins. In 2016, after an extensive review of the best available evidence and latest scientific data in the field, OSHA concluded that exposure to silica constituted a significant risk of material impairment to health and consequently, lowered its permissible exposure limit.¹¹ OSHA's limit originally ranged from 100 to 250 $\mu\text{g}/\text{m}^3$, which was reduced to 50 $\mu\text{g}/\text{m}^3$. OSHA determined that 50 $\mu\text{g}/\text{m}^3$ was the lowest feasible limit that affected industries could reasonably meet, but concluded that significant health risks still exist at this lower limit.

In the decades since the adoption of MSHA's current silica limit, ACGIH, NIOSH, and OSHA all recognized silica as a human carcinogen and lowered their recommended and adopted silica limits accordingly. Nonetheless, MSHA has not changed its legal exposure limit in over 50 years.

When adopting and recommending their respective 50 $\mu\text{g}/\text{m}^3$ limits, both OSHA and NIOSH warned that 50 $\mu\text{g}/\text{m}^3$ is the lowest feasible limit, not the safest. In OSHA's 2016 final rule lowering its silica limit, OSHA indicated that after evaluating the best available evidence it was uncertain if there was any limit that would result in zero harm to workers; however, if such a limit existed, it would likely be lower than 50 $\mu\text{g}/\text{m}^3$.

¹¹ OSHA Final Rule, *Occupational Exposure to Respirable Crystalline Silica*, 81 FR 16285 (March 2016).

MSHA HAS BEEN WORKING ON A RULE TO LOWER THE SILICA EXPOSURE LIMIT FOR OVER TWO DECADES

As early as 2009, MSHA recognized in its regulatory agenda that its standards were outdated and may not protect miners from developing silicosis.¹² To lower MSHA’s silica exposure limit standard would require rulemaking, the process for developing and issuing rules (rules are also referred to as “regulations” or “standards”). As part of its rulemaking efforts, MSHA indicated it intended to use OSHA’s work on health effects and risk assessment, adapting it as necessary for the mining industry.¹³ However, while OSHA completed its rulemaking in 2016 and lowered its limit from a high of 250 µg/m³ to 50 µg/m³, MSHA did not proceed with rulemaking and continued to maintain its decades old standard.

A Government Accountability Office (GAO) study on rulemaking found the average time a federal agency needed to complete rulemaking was about four years.¹⁴ In contrast, MSHA has spent over two decades in rulemaking without changing its silica exposure limit. Since 1996, the agency has started and restarted its rulemaking efforts for silica regulations at least five times – in 1996, 1998, 2003, 2010, and 2014.¹⁵ In August 2019, MSHA again initiated the rulemaking process by formally gathering more data and information on a reduced standard via a Request for Information (RFI). In the spring of 2020, MSHA indicated it would publish a proposed rule to address miners’ exposure to silica, but provided no time frame for completion.¹⁶

Notwithstanding the delays in issuing a rule specific to silica exposure, some progress has been made. MSHA in 2014 issued a new rule—*Lowering Miners’ Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors* (Dust Rule)—that lowered the permitted exposure limit for coal dust (of which silica is a component) from 2.0 to 1.5 milligrams per cubic meter of air (mg/m³). This rule was intended to reduce the airborne concentration of coal dust. MSHA’s data shows coal mines have largely been able to keep silica levels below MSHA’s legal limit of 100 µg/m³ and even lower than the recommended limit of 50 µg/m³ during the period of 2014 to 2019. MSHA requires mines use engineering or environmental controls to manage coal dust levels.¹⁷ We reviewed

¹² Twice a year, MSHA lists all regulations it plans to issue or has recently completed. In Fall 2009, MSHA published Regulation Identifier Number (RIN) 1219-AB36, *Respirable Crystalline Silica Standard* as part of its Regulatory Agenda.

¹³ Ibid.

¹⁴ GAO, *Federal Rulemaking*, GAO-09-205 (April 2009).

¹⁵ DOL/MSHA, RINs 1219-AA99 (Spring 1996), 1219-AA81 (Fall 1996), RIN 1219-AB12 (Spring 1998), and 1219-AB36 (Spring 2010 and 2014).

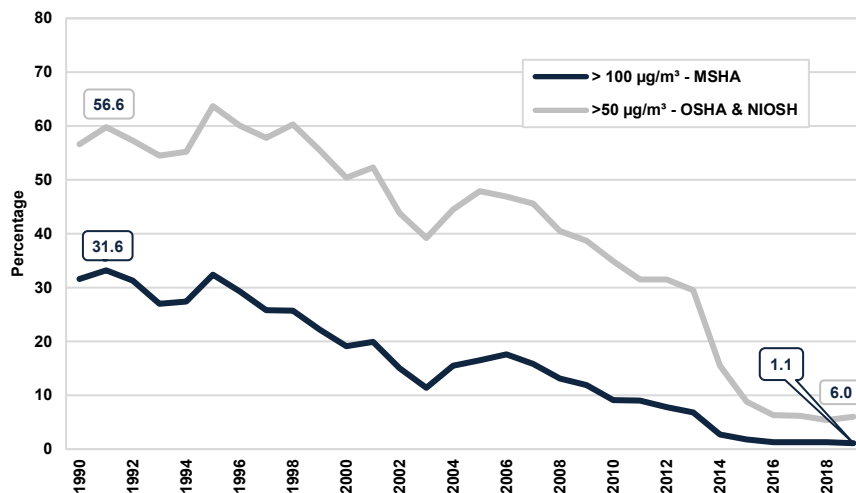
¹⁶ DOL/MSHA, Regulatory Agenda, *Respirable Crystalline Silica (Quartz)*, RIN 1219-AB36 (Spring 2020).

¹⁷ These controls include, but are not limited to, water sprays, wetting agents, ventilation, and dust collectors.

178,360 dust samples collected and analyzed by MSHA inspectors during the period of 1990-2019.¹⁸ The percentage of these samples exceeding 100 µg/m³ dropped from

31 to 1 percent. For 2019, only 151 of 14,113 samples exceeded 100 µg/m³ of silica. Further, we found the percentage of samples that exceeded 50 µg/m³ fell from 57 percent in 1990 to 6 percent in 2019. See

FIGURE 2: PERCENTAGE OF MSHA SAMPLES EXCEEDING ESTABLISHED AND RECOMMENDED SILICA EXPOSURE LIMITS (1990-2019)



Source: MSHA provided data.

Figure 2. This shows that coal mines have and can meet the recommended silica limit of 50 µg/m³.

While the lower levels in recent years can reduce risks to miners, the overall number of black lung related deaths over the past five decades and increase in coal miners diagnosed with black lung disease are alarming. With no legal requirement for mines to keep silica levels well below MSHA’s current limit, which scientific evidence has shown to be unsafe, workers in coal mines with silica levels above recommended safety limits continue to be at risk of developing life-threatening health problems.

MSHA CANNOT ISSUE FINES FOR EXCESS SILICA EXPOSURES

MSHA has not set a separate standard for silica limits in coal mines. Instead, MSHA’s exposure limit for silica is tied to its exposure limit for respirable coal mine dust. Thus, violating MSHA’s silica, but not its coal dust limit, does not result in a citation or civil monetary penalty (i.e., fine) to deter future violations.

Since silica is a component of coal dust, MSHA assumes that reducing overall coal dust levels will also reduce silica levels. This assumption is based on a

¹⁸ Our analysis included 2,366, or 1 percent, of 178,360 dust samples collected and analyzed by MSHA inspectors that lacked a value for dust concentration, dust standard, or silica content.

formula HHS prescribed in 1971, in which HHS posited that reducing the amount of coal dust would also reduce the levels of silica to which miners are exposed. However, MSHA generally samples for coal and silica levels only during its required inspections for underground (quarterly) and surface (semiannually) coal mines. Only when MSHA inspector samples exceed both the coal dust and silica limits does MSHA issue a citation, assess a monetary penalty for exceeding the coal dust limit, and place the mine on a reduced coal dust standard.

From 2000 to 2019, MSHA's proposed penalties for violating its coal dust limit ranged from \$55 to \$47,700. When mines violate MSHA's silica limit, but not the coal limit, MSHA will place the mine on a reduced standard and review the respirable dust controls detailed in the mine's plan for revision and/or continued approval to address high levels of silica. However, MSHA does not issue a citation or fine because excessive silica levels alone are not, in and of themselves, a hazard for which MSHA can cite and fine mine operators. To be able to cite and fine mines for excess silica levels alone, MSHA would have to establish a separate lower limit not tied to coal dust by creating a new regulation.

Over two decades ago, both NIOSH and the Secretary of Labor's Advisory Committee recognized the risks of tying the silica exposure limit for coal mines to the coal dust standard. Thus, in 1995, NIOSH recommended DOL create a separate exposure limit for silica. In 1996, the Advisory Committee agreed with NIOSH in recommending that MSHA develop a separate and enforceable limit for silica that is not tied to coal dust. In 2011, NIOSH repeated its 1995 recommendation to establish a separate compliance standard to effectively limit coal miners' exposure to unsafe levels of silica.

MSHA indicated that it did not adopt a separate standard earlier because most of its sampling results were below the lower recommended limits and continued to trend downward. While MSHA's data indicates silica exposure levels are improving, a separate standard for silica, as NIOSH and the Advisory Committee recommended, that allows MSHA to issue citations and fines for violating its silica limit, would give MSHA the same enforcement tools it has to help keep coal dust levels low and better protect miners from this toxic mineral.

**MSHA'S SILICA SAMPLING PROTOCOLS
MAY BE TOO INFREQUENT TO BE
SUFFICIENTLY PROTECTIVE**

While the 2014 Dust Rule resulted in an increased number of overall coal dust samples taken and required miners to wear Continuous Personal Dust Monitors (CPDM) to monitor overall dust exposures, it did not increase the frequency of

MSHA's silica testing activities in coal mines. Since the MINE Act requires MSHA to inspect underground coal mines quarterly and surface mines semiannually, MSHA generally sampled mines for silica levels only during these periodic inspections. Silica levels, however, fluctuate frequently and unpredictably. Changes in geology and movement of personnel within mines mean that miners' exposure to silica may change on a daily, if not hourly basis. As a result, MSHA's infrequent sampling protocols—two or four times a year—placed miners at unnecessary risk for silica exposure.

According to Federal standards for internal control, management should obtain data on a timely basis so that it can be used for effective monitoring.¹⁹ MSHA inspectors sampled for coal dust and then analyzed those samples for silica only during their regular inspections of coal mines, which occurred four times a year for underground mines and twice a year for surface mines.²⁰ These intervals between inspections may have left miners vulnerable to potentially elevated silica exposures for many months at a time.

Numerous stakeholders who publicly commented on MSHA's August 2019 RFI – United Mine Workers Association, National Coalition of Black Lung and Respiratory Disease Clinics, and the American Thoracic Society – suggested that MSHA's infrequent sampling might have resulted in an incomplete and inaccurate picture of overall silica levels in coal mines. NIOSH also raised concerns that the time between sample collection and analysis of the results at the mine site limited occupational health professionals' ability to promptly address risks of overexposures.

Our own research bears out these concerns. We found significant fluctuations in silica levels even for the same entity number at a mine.²¹ We analyzed 48,717 coal dust samples MSHA collected and analyzed for silica content. In our non-statistical analyses, we selected two mines with at least 10 years of coal dust samples taken for the same entity number within an occupation at risk of exposure to silica (i.e., a continuous miner operator). We found silica levels varied between months and years. For example, we found a sample taken for Mine 1 on February 1, 2016, contained 22 $\mu\text{g}/\text{m}^3$ of silica, well below MSHA's 100 $\mu\text{g}/\text{m}^3$ limit and NIOSH's recommended limit of 50 $\mu\text{g}/\text{m}^3$. However, the next sample taken on May 17, 2016, contained 310 $\mu\text{g}/\text{m}^3$, over three times MSHA's

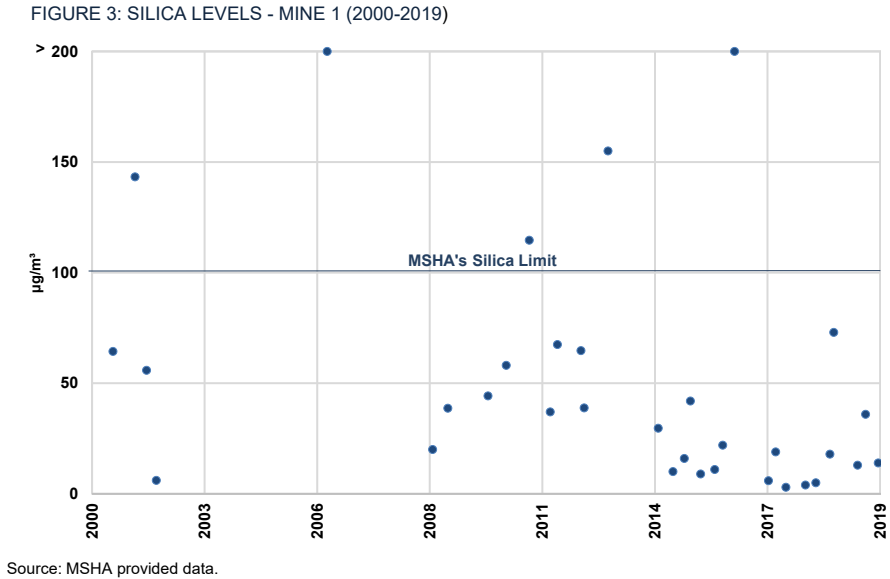
¹⁹ GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (September 2014).

²⁰ MSHA Handbook Series, *Mine Safety and Health Enforcement General Inspection Procedures Handbook*, PH19-IV/V-1 (December 2019) and *Coal Mine Health Inspection Procedures Handbook*, PH89-V-1 (27) (June 2016).

²¹ MSHA assigned an entity number to identify each continuous miner operator that was sampled.

silica limit and six times that of NIOSH’s recommended limit. Figure 3 shows the variability of silica levels over a period of 19 years for Mine 1.

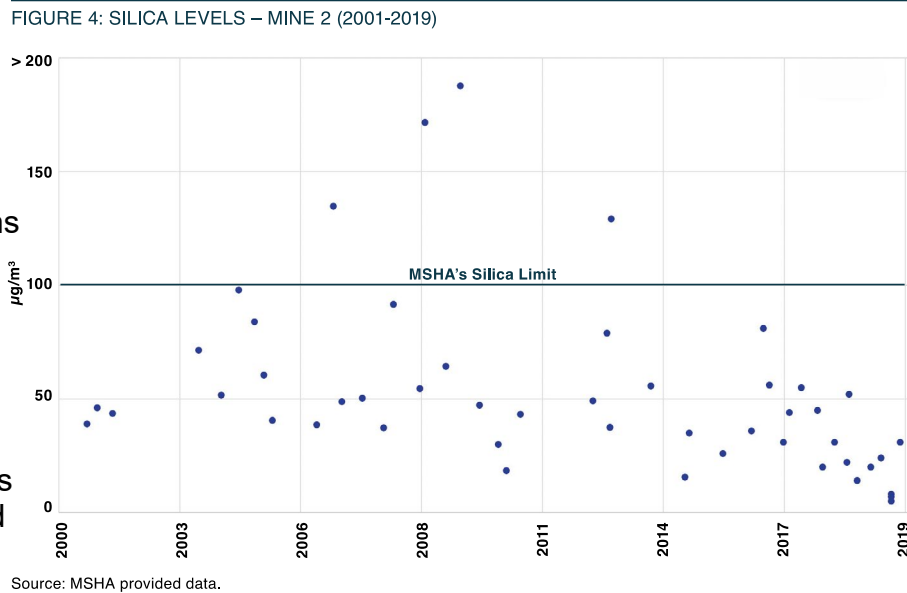
Similar to our analysis for Mine 1, we found silica levels in samples varied between months and years for Mine 2. For example, we noted silica levels rising to 171.6 $\mu\text{g}/\text{m}^3$ in January 2009



and peaking at 187.8 $\mu\text{g}/\text{m}^3$ in November 2009, all above MSHA’s silica limit. Then, silica levels dropped much lower to 5 $\mu\text{g}/\text{m}^3$ in August 2019. See Figure 4 for the variability of silica levels over a period of 18 years for Mine 2.

The 2014 Dust Rule increased the number of samples collected and analyzed for compliance purposes, but not the frequency. Under the Dust Rule, MSHA

expanded its compliance sampling program to include underground mine occupations that were at an elevated risk of dust exposure but were not previously covered, such as coal haulers and roof bolter operators.



This increased the number of overall coal mine samples MSHA inspectors collected and analyzed. See Exhibit 2 for more details on samples collected and analyzed during the period of 1990-2019.

The rule also mandated that coal miners must carry with them CPDMs that provide real time, individualized readings of their exposure to coal dust. This allows miners to adjust to their work environment based on coal dust exposures reported every 30 minutes. MSHA also uses data captured from CPDMs to enforce compliance with the overall dust limit established by the Dust Rule.

All that said, variances in mine geology and mining activities cannot be captured by samples taken under MSHA's current requirement of two or four times a year. Silica levels can vary due to changes in geological conditions (i.e., the mix of rock, silica and coal) as mining progresses,²² and these infrequent samples only represent the level of silica at a certain point in time. The long gaps between MSHA's required samples allow for possible overexposures to silica that put miners' safety at risk. To help protect miners from silica exposure, MSHA could enhance its sampling program by increasing the frequency of sampling where needed. For example, MSHA could use a data-driven, risk-based approach without taxing its resources. While there is no CPDM equivalent device available for measuring silica exposures, efforts are underway to develop a device that would enable MSHA to better measure the level of silica in coal mines. NIOSH has indicated that it is working on several initiatives to develop a real-time personal silica monitor that could provide more timely individualized estimates of silica exposure levels in coal mines.

CONCLUSION

Since the 2014 Dust Rule was implemented, silica levels in most coal mines dropped below 50 $\mu\text{g}/\text{m}^3$, half the limit MSHA allows. While the reduction of silica improves conditions for miners, the overall number of black lung related deaths over the past five decades and increase in coal miners with black lung disease are alarming. With no legal requirement for mines to keep silica levels well below MSHA's current limit of 100 $\mu\text{g}/\text{m}^3$, coal miners exposed to silica levels above recommended safety limits continue to be at risk of developing life-threatening health problems.

Given the ongoing risk to miners' health from exposure to silica, a known carcinogen, MSHA needs to do more to protect coal miners from silica.

²² NIOSH, *Evaluation of the Approach to Respirable Quartz Exposure in US Coal Mines* (2011) and *Current Intelligence Bulletin 64: Coal Mine Dust Exposures and Associated Health Outcomes - A Review of Information Published Since 1995* (2011).

OIG'S RECOMMENDATIONS

We recommend the Assistant Secretary for Mine Safety and Health:

1. Adopt a lower legal exposure limit for silica in coal mines based on recent scientific evidence.
2. Establish a separate standard for silica that allows MSHA to issue a citation and monetary penalty when violations of its silica exposure limit occur.
3. Enhance its sampling program to increase the frequency of inspector samples where needed (e.g., by implementing a risk-based approach).

SUMMARY OF MSHA'S RESPONSE AND OIG COMMENTS

The Assistant Secretary did not fully agree with our recommendations, but indicated MSHA would take appropriate corrective actions. Specifically, MSHA will issue a proposed rule to address Recommendations 1 and 2. MSHA stated, however, it could not “presume the substance” of a proposed or final rule and therefore could not agree specifically to a lower silica limit. We note that in 2010, however, MSHA issued a proposed rule explicitly lowering its then existing coal dust limit from 2.0 mg/m³ to 1.0 mg/m³.²³ In this report, we have clearly articulated, and MSHA has recognized, a problem that can only be solved with an updated regulation. As noted in the report, MSHA, as early as 2009, recognized its regulations were outdated and may not protect miners from developing silicosis. Over the decades, MSHA started and restarted its rulemaking efforts for silica regulations at least five times—in 1996, 1998, 2003, 2010, and 2014. In August 2019, MSHA restarted its efforts yet again. The OIG is concerned that beginning the rulemaking process anew without considering the abundance of evidence MSHA has already collected will result in miners’ unnecessarily continued exposure to unsafe levels of silica.

As to Recommendation 3, MSHA stated it will initiate a study to determine if any increase in the frequency of inspector sampling is needed, and if so, under what conditions to address this recommendation. MSHA’s written response to our draft report is included in its entirety in Appendix B.

²³ DOL/MSHA, RIN 1219-AB64 (October 2010).

We appreciate the cooperation and courtesies MSHA extended us during this audit. OIG personnel who made major contributions to this report are listed in Appendix C.

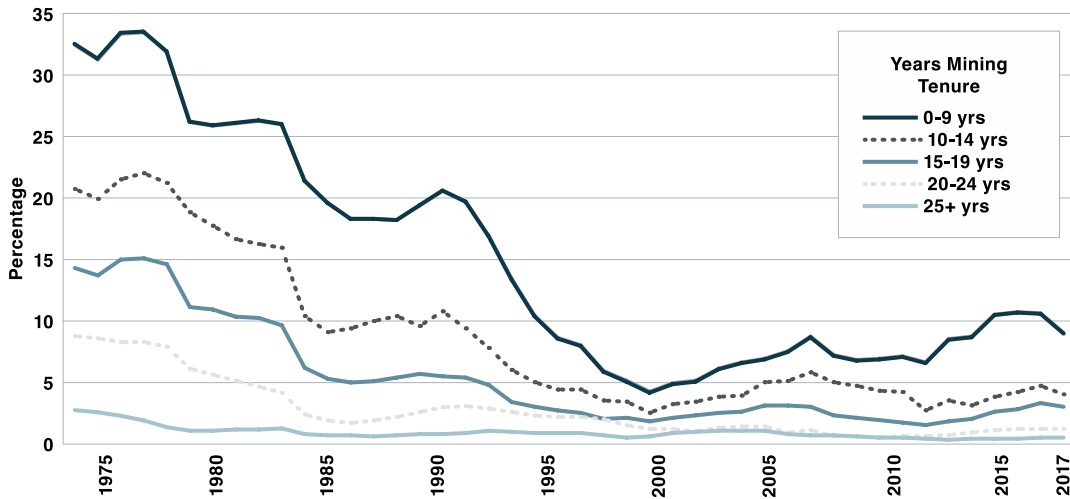


Elliot P. Lewis
Assistant Inspector General for Audit

EXHIBIT 1

Exhibit 1 shows the prevalence of black lung disease starting to increase since the 2000s for underground coal miners with less than 9 years to over 25 years of experience. The total number of miners with over 25 years of mining tenure with black lung peaked during 1970-1974 at 8,562 affected miners (32.5 percent) of 26,317 miners participating in the CWHSP.²⁴ By 1995-1999, this number fell to 99 (4.2 percent) affected miners of 2,371 participating miners. For 2010-2014, miners with black lung steadily increased to 344 (10.3 percent) affected miners of 3,327 participating miners – more than triple the number from 1995-1999.

EXHIBIT 1: PERCENTAGE OF EXAMINED COAL MINERS WITH BLACK LUNG (1970-2017*)



Source: NIOSH provided CWHSP data.

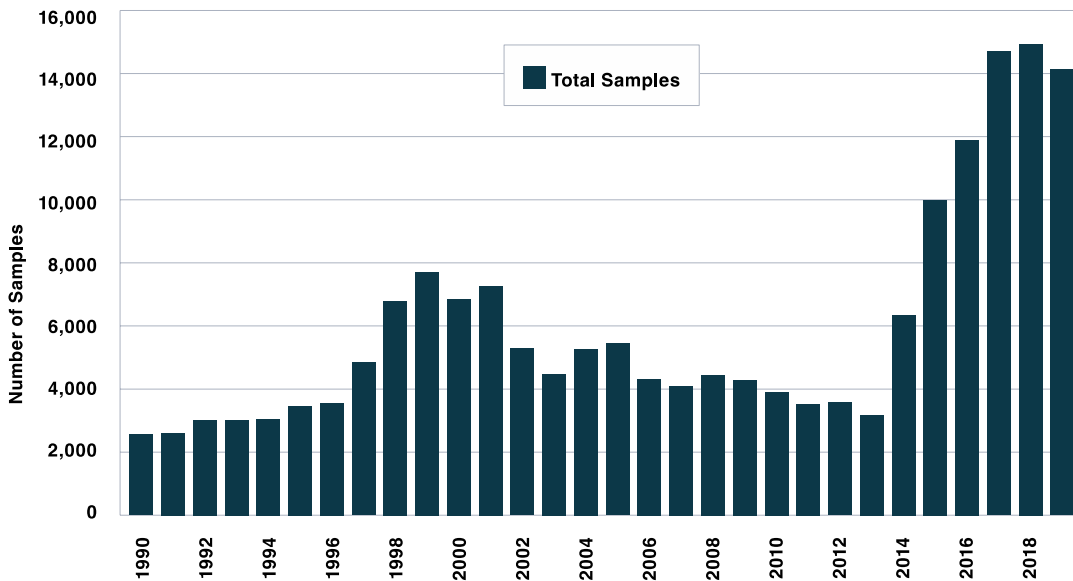
*NIOSH did not start collecting data on surface coal miners until 2014. However, this data was not included in the above graph because it only represents 5-year moving averages. For example, the data point for 1974 is the average of 1970, 1971, 1972, 1973, and 1974 data.

²⁴ NIOSH administers CWHSP, which offers periodic lung function testing, respiratory health assessment questionnaires, and extended health surveillance for surface (as of August 1, 2014), underground, and contract coal miners.

EXHIBIT 2

Exhibit 2 shows the total number of coal dust samples MSHA collected and analyzed for silica content from 1990 to 2019. Prior to MSHA’s 2014 Dust Rule, the maximum dust samples MSHA collected and analyzed for coal dust and silica was 7,701 in 1999. After the rule went into effect on August 1, 2014, the number of dust samples collected and analyzed for silica by MSHA increased. In 2019, MSHA collected and analyzed 14,113 samples for silica, compared to only 3,183 in 2013.

EXHIBIT 2: TOTAL NUMBER OF COAL DUST SAMPLES MSHA COLLECTED AND ANALYZED (1990-2019)



Source: MSHA provided data.

APPENDIX A: SCOPE, METHODOLOGY, & CRITERIA

SCOPE

This audit covered MSHA's silica regulations from 1969 through 2020 and respirable coal dust sample data for the period of January 1, 1990 through December 31, 2019. We excluded voided samples and Part 90 miner samples.²⁵

METHODOLOGY

We conducted this performance audit 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 objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

To address our audit objective, we obtained an understanding of applicable laws, regulations, requirements, policies and guidance for MSHA's regulation of silica and interviewed MSHA officials. We reviewed MSHA's processes and controls for respirable coal mine and silica dust. We reviewed numerous studies documenting the rise in black lung disease, cases of PMF, the dangers of respirable coal mine dust and respirable silica, MSHA's dust sampling practices and coal mines' work practices. We reviewed MSHA's August 29, 2019 RFI related to respirable silica and corresponding public comments, as well as the public meeting for the RFI held on October 17, 2019. As part of our work, we interviewed various stakeholders, such as the United Mine Workers, the National Mining Association, and the Appalachian Citizens Law Center. We also conferred with subject matter experts from OSHA, NIOSH, ACGIH and the University of Illinois – Chicago (UIC) Black Lung Center of Excellence for matters related to exposure limits, lung disease, respirable coal mine dust, and respirable silica. We also reviewed related policy documentation used to establish their respective recommended and enforceable silica limits.

²⁵ Part 90 miners are coal miners who have evidence of the development of black lung disease.

Data Reliability

To assess the reliability of MSHA's 1990-2019 coal dust and silica sample data, we reviewed existing information about the data and the systems that produced them, performed electronic testing to determine the validity of specific data elements that we intended to use to perform our work, and compared the data MSHA provided to data posted on its public website. Based on our results, we determined the coal dust and silica sample data were sufficiently reliable for the purposes of this report.

To identify coal dust samples that exceeded MSHA's 100 µg/m³ and the recommended 50 µg/m³ silica exposure levels respectively, we analyzed 178,360 MSHA collected coal dust samples for the 29-year period from 1990 through 2019. This analysis includes 2,366, or 1 percent, of MSHA-collected coal dust samples that lacked a value for dust concentration, dust standard, or silica content. Additionally, out of the 178,360 MSHA collected coal dust samples, we identified two mines with at least 10 years of coal dust sample data taken for the same occupation and sampled entity to demonstrate the variability of silica levels.

Internal Controls

In planning and performing our audit, we considered MSHA's internal controls relevant to our audit objective by obtaining an understanding of those controls and assessing control risks relevant to our objective. We considered the internal control elements of control environment, risk assessment, control activities, information and communication, and monitoring during our planning and substantive phases and evaluated relevant controls. The objective of our audit was not to provide assurance of the internal controls; therefore, we did not express an opinion on MSHA's internal controls. Our consideration of internal controls for administering the accountability of the program would not necessarily disclose all matters that might be significant deficiencies. Because of the inherent limitations on internal controls, or misstatements, noncompliance may occur and not be detected.

CRITERIA

- Federal Coal Mine Health and Safety Act of 1969, Public Law 91-173 (1969)
- Federal Mine Safety and Health Act of 1977, Public Law 95-164 (1977)
- 30 Code of Federal Regulations (CFR) § 70, Mandatory Health Standards-Underground Coal Mines (2019)
- 30 CFR § 71, Mandatory Health Standards-Surface Coal Mines and Surface Work Areas of Underground Coal Mines (2019)
- MSHA Final Rule, *Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors*, 79 Federal Register (FR) 24813 (May 2014)
- MSHA Handbook Series, *Coal Mine Health Inspection Procedures Handbook*, PH89-V-1 (27) (June 2016)
- MSHA Handbook Series, *Mine Safety and Health Enforcement General Inspection Procedures Handbook*, PH19-IV/V-1 (December 2019)
- Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers, *Report of the Secretary of Labor's Advisory Committee on the Elimination of Pneumoconiosis Among Coal Mine Workers* (October 1996)
- NIOSH, *Criteria For A Recommended Standard Occupational Exposure To Crystalline Silica*, HEW Publication No. (NIOSH) 75-120 (1974)
- NIOSH, *Criteria For A Recommended Standard Occupational Exposure To Respirable Coal Mine Dust*, DHH (NIOSH) Publication No. 95-106 (September 1995)
- ACGIH, *Silica, Crystalline – Quartz TLV-TWA 0.05 mg/m³* (2001)
- ACGIH, *Silica, Crystalline – α -Quartz and Cristobalite TLV-TWA 0.025 mg/m³* (2010)
- 29 CFR §1910, Occupational Safety and Health Standards (2019)
- 29 CFR §1915, Occupational Safety and Health Standards for Shipyard Employment (2019)
- 29 CFR §1926, Safety and Health Regulations for Construction (2016)
- OSHA Final Rule, *Occupational Exposure to Respirable Crystalline Silica*, 81 FR 16285 (March 2016)

APPENDIX B: AGENCY'S RESPONSE TO THE REPORT

U.S. Department of Labor

Mine Safety and Health Administration
201 12th Street South, Suite 401
Arlington, Virginia 22202-5452



OCT 27 2020

MEMORANDUM FOR: ELLIOT P. LEWIS
Assistant Inspector General for Audit

FROM: DAVID G. ZATEZALO
Assistant Secretary of Labor for
Mine Safety and Health Administration

SUBJECT: Response to the Office of the Inspector General's (OIG) Draft
Audit Report, *MSHA Needs To Improve Efforts To Protect Coal
Miners From Respirable Crystalline Silica*

David G. Zatezalo

The Mine Safety and Health Administration (MSHA) appreciates the opportunity to comment on the OIG's report. Please see MSHA's response to the OIG recommendations below.

MSHA also appreciates the OIG recognizing the positive impact of MSHA's 2014 respirable coal mine dust rule. The 2014 rule lowered the concentration of respirable coal mine dust, increased the number of coal dust samples measured, and required operators to use Continuous Personal Dust Monitors to measure miners' exposure to respirable dust. As noted in the report, since the onset of 2014 rule, MSHA's silica/quartz levels in most coal mines dropped below 50 µg/m³, half the limit MSHA allows.

The OIG's draft report contains three recommendations. MSHA's response follows:

Recommendation 1: Adopt a lower exposure limit for silica in coal mines based on recent scientific evidence.

Response: At this time, MSHA cannot agree with this recommendation. MSHA will publish a proposed rule to address miners' exposure to respirable quartz. As you know with all rulemakings, at this point in the process, MSHA cannot presume either the substance of the proposed or final rule. Under Section 101(a) of the Federal Mine and Safety and Health Act of 1977, as amended by the Mine Improvement and New Emergency Response (MINER) Act of 2006, the proposal must go through the notice and comment process, which includes solicitation of comments from stakeholders. This allows the public opportunity to submit both written comments and to present testimony at public hearings, if requested. The substance of the final rule would be based on the comments and testimony received during the rulemaking process.

Recommendation 2: Establish a separate standard for silica that allows MSHA to issue a citation and monetary penalty when violations of its silica exposure limit occur.

Response: At this time, MSHA cannot agree with this recommendation. MSHA will publish a proposed rule to address miners' exposure to respirable quartz. As you know with all rulemakings, at this point in the process, MSHA cannot presume either the substance of the proposed or final rule. Under Section 101(a) of the Federal Mine and Safety and Health Act of 1977, as amended by the Mine Improvement and New Emergency Response (MINER) Act of 2006, the proposal must go through the notice and comment process, which includes solicitation of comments from stakeholders. This allows the public opportunity to submit both written comments and to present testimony at public hearings, if requested. The substance of the final rule would be based on the comments and testimony received during the rulemaking process.

Recommendation 3: Enhance its sampling program to increase the frequency of inspector samples where needed (e.g., implementing a risk-based approach).

Response: MSHA will study this recommendation, including a risk-based approach to whether any increase in the frequency of inspector sampling is needed, and if so, under what mining conditions.

MSHA appreciates the opportunity to comment on the report. If you have any questions or need further information, please contact Patricia W. Silvey, Deputy Assistant Secretary for Mine Safety and Health.

APPENDIX C: ACKNOWLEDGEMENTS

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