	As of: 7/11/19 12:43 PM **Received:** July 09, 2019 **Status:** Posted **Posted:** July 11, 2019 **Tracking No.** 1k3-9axx-lw6u **Comments Due:** July 09, 2019 **Submission Type:** Web

PUBLIC SUBMISSION

Docket: MSHA-2018-0014
Dust Retrospective Study

Comment On: MSHA-2018-0014-0001
Retrospective Study of Respirable Coal Mine Dust Rule

Document: MSHA-2018-0014-0008
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General Comment

See attached

Attachments

silica comment_final final

AB90-COMM-5

July 9, 2019

Office of Standards, Regulations, and Variances
Department of Labor
Mine Safety and Health Administration
201 12th Street South, Room 4E401
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Comment on Request for Information Regarding the Retrospective Study of Respirable Coal Mine Dust Rule

The Center for Science in the Public Interest (CSPI) respectfully submits the following comments in response to the Mining Safety and Health Administration's (MSHA's) request for information (RFI). This RFI follows the publishing of MSHA's final rule titled *Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors (CPDMs)* in 2014.[1] In this rule, MSHA revised its coal mine dust standard, but did not establish a separate standard for respirable silica, despite longstanding recommendations from the Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health (NIOSH) and others for the agency to do so.[2] The Federal Register notice for the present RFI states that "MSHA intends to continue its consultations [with interested parties and NIOSH] [...] on best practices for controlling coal mine dust and quartz exposures."[3] Our comment responds to MSHA's continued interest in controlling such exposures by describing recent exposures and trying to assess the impact of the coal dust rule upon quartz exposures.

CSPI has obtained and analyzed MSHA data that demonstrate that, while the 2014 rule achieved a significant reduction in exposure to silica in underground coal mines, hundreds (and likely thousands) of miners remain exposed to levels of silica dust that are known to increase the risk of silicosis and other serious morbidities. Therefore, there remains a need for MSHA to adopt and enforce a separate silica dust standard in addition to the Permissible Exposure Level (PEL) for respirable dust enacted in 2014.

Methods

The data obtained by CSPI included total dust concentration for all samples containing percentage quartz measurements taken between 2010 and 2018. These data are publicly available in two separate datasets—the Coal Dust Samples dataset and Quartz Samples dataset—and can be linked by cassette number.[4] Our analysis was limited to samples that were (1) designated by MSHA as valid (not voided); (2) collected by MSHA inspectors (as opposed to operators); (3) "full-shift" samples (≥8 hours); and (4) taken from underground and surface coal mines. The dataset included 63,358 such samples. We calculated total silica dust concentration in $\mu g/m^3$ for each sample by multiplying the total dust concentration by the measured quartz percentage.

1 https://www.federalregister.gov/documents/2014/05/01/2014-09084/lowering-miners-exposure-to-respirable-coal-mine-dust-including-continuous-personal-dust-monitors
2 https://www.cdc.gov/niosh/docs/95-106/default.html
3 https://www.govinfo.gov/content/pkg/FR-2018-07-09/pdf/2018-14536.pdf#page=1
4 https://arlweb.msha.gov/OpenGovernmentData/OGIMSHA.asp

Silica Levels Compared to Existing PELs

We analyzed the number of samples each year that exceeded 100 μg/m^3, the concentration established as a de facto silica standard by the 2014 MSHA dust rule,[5] as well as the number exceeding 50 μg/m^3, which is OSHA's specific PEL for silica dust.

Table 1 shows the nine-year average silica exposure in underground and surface coal mines from 2010-2018 the Designated Occupation (DO) category of worker, which is defined as workers having exposure to the greatest respirable dust concentration within the mining unit,[6] and all other workers. On average, workers in surface mines are exposed to silica dust concentrations that are 8 μg/m^3 higher than workers in underground mines. Mean exposure among DOs is, on average, 11 μg/m^3 higher than all other occupations.[7]

Table 2 shows the number and percent of samples from underground coal mines exceeding OSHA (50 μg/m^3) and MSHA (100 μg/m^3) standards by year for all occupations. From 2010 to 2013, 33 percent of samples exceeded 50 μg/m^3 and 8 percent of samples exceeded 100 μg/m^3. From 2015 to 2018, 7 percent of samples exceeded 50 ug/m^3 and 1 percent of samples exceeded 100 μg/m^3. Comparing the four years before and after the year in which the final dust rule was published (2014), the proportion of samples exceeding MSHA's standard decreased by 84 percent and the proportion of samples exceeding OSHA's PEL decreased by 79 percent. That said, in 2018 there remained 721 samples, representing 125 unique entities, above 50 μg/m^3 and 142 samples, representing 60 unique entities, above 100 μg/m^3.

Table 3 shows the number and percent of samples from surface coal mines exceeding OSHA and MSHA standards. On average, silica levels were higher in surface coal mines than in underground ones. From 2010 to 2013, 46 percent of samples exceeded 50 μg/m^3 and 14 percent exceeded 100 μg/m^3. From 2015-2018, 11 percent of samples exceeded 50 μg/m^3 and 3 percent exceeded 100 μg/m^3. Comparing the four years before and after 2014, the proportion of samples exceeding MSHA's standard decreased by 74 percent and the proportion of samples exceeding OSHA's PEL decreased by 77 percent. In 2018, 119 samples representing 36 unique entities exceeded 50 μg/m^3 and 50 samples from 22 entities exceeded 100 μg/m^3.

Tables 4 and 5 show the number and percent of samples representing DOs (n=15,888) in underground and surface coal mines exceeding OSHA and MSHA standards. Of course, these are the workers of greatest concern. Compared with all other occupations, the proportion of samples exceeding OSHA and MSHA standards in underground coal mines was higher and the percent decrease in silica exposure (2010-2013 versus 2015-2018) somewhat smaller for DOs. For those workers, from 2010 to 2013, 33 percent of samples exceeded 50 μg/m^3 and 9 percent

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5 The 2014 rule sets the standard for total respirable dust at each mine "by dividing the percent of quartz into the number 10" (30 CFR §70.101). Applying this equation to almost any mine's dust concentration and quartz percentage measurements reveals a standard of 100 ug/m^3. For example, 10/0.1% = 100mg/m3 = 100,000 ug/m3 → 100,000 x 0.001 = **100 ug/m3 quartz;** and 10/5.25%=1.9 mg/m3 = 1900 ug/m3→ 1900 x 0.0525 = **100 ug/m3 quartz.** MSHA's Coal Mine Health Inspection Procedures handbook reinforces this de facto standard by stating that, "[i]n some cases, it may be necessary to establish a reduced standard for an entity when a respirable dust sample contains more than 100 ug/m^3 quartz." The 2014 rule also sets a new dust standard of 1.5 mg/m^3, and a reduced standard will not be enforced until the percent respirable quartz dust exposure is over 5%.
6 30 CFR §70.208
7 We acknowledge that an alternative method of presenting these data would have been to use a geometric mean.

of samples exceeded 100 μg/m^3. From 2015 to 2018, 10 percent of samples exceeded 50 μg/m^3 and 2 percent of samples exceeded 100 μg/m^3. Comparing the four years before and after the year in which the final dust rule was published, the proportion of samples from DOs in underground mines exceeding MSHA's standard decreased by 73 percent and the proportion of samples exceeding OSHA's PEL decreased by 70 percent. For DOs in surface mines, from 2010 to 2013, 30 percent of samples exceeded 50 μg/m^3 and 7 percent of samples exceeded 100 μg/m^3. There are relatively few measurements after 2014. Of 84 samples from 2015, eight (10 percent) exceeded 50 μg/m^3 and none exceeded 100 μg/m^3. Due to the paucity of data, we did not calculate percentage reductions.

Trends in Silica Exposure

Figure 1 shows the trend in silica dust concentration over time in underground coal mines for all occupations. On average, silica dust exposure was about 50 μg/m^3 from 2010 to 2013 and 22 μg/m^3 from 2015 to 2018 (the four years preceding and following 2014, the year in which the final rule was published), a 55 percent reduction.[8] However, the downward-sloping regression line based on 2010-2013 data indicates that some of this reduction was occurring even prior to 2014. Taking that trend into account, the linear regression would have predicted an average concentration of about 35 μg/m^3 in 2018, while the actual average concentration for 2018 was 21 μg/m^3. Therefore, we may reasonably attribute a 40 percent decrease in mean silica dust exposure in underground coal mines to the 2014 dust rule.[9]

Figure 2 shows the trend in silica dust concentration over time for all workers in surface coal mines. On average, silica dust exposure was 64 μg/m^3 from 2010 to 2013 and 27 ug/m^3 from 2015 to 2018, a 58 percent reduction. However, the regression line based on 2010-2013 data would have predicted an average concentration of 34 μg/m^3 in 2018, while the actual average in 2018 was 25 μg/m^3, a 27 percent decrease in mean silica dust exposure in surface coal mines reasonably attributable to the 2014 dust rule.

Figures 3 and 4 show the trends in silica dust concentration over time for DOs in underground and surface coal mines, respectively. The average silica dust exposure for DOs in underground mines was about 50 μg/m^3 in 2010-2013 and 27 μg/m^3 in 2015-2018, a decrease of 47 percent. The regression line based on 2010-2013 data would have predicted an average of about 27 μg/m^3 in 2018, similar to that produced by the regression line for 2015-2018 (26 μg/m^3), so it is not clear that any significant decrease in exposure to the highest risk workers can be attributed to implementation of the 2014 dust rule.

For DOs in surface coal mines there were fewer samples available for analysis, especially after 2015 (n<14 for each year). However, based on available data from 2010 through 2015, the average silica dust exposure for DOs in surface mines was about 48 μg/m^3 in 2010-2013 and 21

8 The 2014 MSHA rule changed the period of dust measurement from eight hours to the length of the worker's shift, which is often longer than eight hours. This change resulted in a measurement period similar to that in the original epidemiological studies that established the hazards of coal dust. The result is that (1) the measurements prior to 2014 are likely underestimates of actual worker exposure; and (2) our analysis may underestimate the relative effectiveness of the rule.

9 Declining levels prior to the deadline may have represented preemptive implementation of the new rule; therefore our analysis may underestimate the relative effectiveness of the rule.

μg/m^3 in 2015, a decrease of 57 percent, The regression line based on 2010-2013 data would have predicted an average silica dust concentration of about 36 μg/m^3 in 2015. Therefore, we may attribute a 42 percent decrease in silica exposure for DOs in surface coal mines to the 2014 dust rule, although the data are sparse.

Data Interpretation

While the 2014 dust rule did reduce coal miners' exposure to silica dust, one in every seventeen inspector samples taken between 2015 and 2018 yielded silica levels exceeding the OSHA PEL of 50 μg/m^3. Exposures for DOs (10% exceeding the OSHA PEL) and in surface mines (11% exceeding the OSHA PEL) were higher still.

Results from a previous analysis of MSHA data by NIOSH scientists found that 9 percent of MSHA inspector samples collected from 1982 to 2017 exceeded 5 percent quartz, with the mean quartz percent remaining above 5 percent in certain districts in 2017.[10] The present analysis differs from that reported by the NIOSH scientists because that paper was limited to underground coal mines and focused on differences in exposure based on geographic district for a period of 35 years. This analysis, however, looks at both underground and surface mines, focuses on the years immediately before and after the 2014 dust rule was implemented, and evaluates trends in the number and proportion of dust samples with high silica concentration over time. Both analyses identify excess risk associated with elevated silica dust exposure that is unacceptable and preventable, as evidenced by the majority of mines in the NIOSH paper and our analysis achieving levels below the 50 μg/m^3 level.

OSHA's final rule on *Occupational Exposure to Respirable Crystalline Silica*, published in 2016, includes a summary of health and risk findings that led the agency to establish a PEL of 50 μg/m^3.[11] The agency reviewed the best available evidence in the peer-reviewed scientific literature and determined that exposure to respirable crystalline silica increases the risk of silicosis, lung cancer, other non-malignant respiratory disease (NMRD), and renal and autoimmune effects.

In that analysis, the previous OSHA PEL of 100 μg/m^3 (in effect, today's MSHA PEL) was found to permit an excess risk of between 11 and 54 deaths per 1,000 from lung cancer, between 60 and 773 deaths per 1,000 from silicosis, 39 deaths per 1,000 from renal disease, and between 11 and 85 deaths per 1,000 from NMRD, for workers exposed at that level for a working lifetime of 45 years. Overall, a PEL of 100 μg/m^3 would permit a total excess lifetime risk of between 121 and 951 deaths per 1,000 workers for all four causes of mortality combined. These are extraordinary risks, and based on our analysis, at least hundreds (and likely thousands) of workers remain exposed at that level.[12]

According to OSHA's analysis, "[a]t the revised PEL of 50 μg/m^3 respirable crystalline silica, these estimated risks are substantially reduced." At 50 μg/m^3, the excess lifetime risk is between

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10 Doney et al. Respirable coal mine dust in underground mines, United States, 1982-2017. *Am J Ind Med.* 2019; 62: 478-485.
11 https://www.osha.gov/laws-regs/federalregister/2016-03-25-1
12 https://www.eia.gov/coal/annual/pdf/acr.pdf

5 and 22 deaths per 1,000 from lung cancer, between 20 and 170 deaths per 1,000 from silicosis, 32 deaths per 1,000 workers for renal disease, and between 7 and 44 deaths per 1,000 workers from NMRD. That is, even a PEL of 50 $\mu g/m^3$ would permit a total excess lifetime risk of between 64 and 268 deaths per 1,000 workers for all four causes of mortality combined. Therefore, assuming exposure over a working lifetime of 45 years, decreasing the PEL from 100 $\mu g/m^3$ to 50 $\mu g/m^3$ would prevent the deaths of between 57 and 683 workers per 1,000 from causes related to occupational silica dust exposure.

MSHA has the authority to set a PEL for respirable silica in underground coal mines of 50 $\mu g/m^3$ or lower. This action would save lives and bring MSHA into alignment with OSHA as well as the recommendations from the National Institute for Occupational Safety and Health (NIOSH).[13] In addition, this action should not be limited to coal mines but should extend to the metal/nonmetal industry where silica exposure is also high and MSHA has also not set any silica-specific standards.[14] In all cases, new comprehensive silica standards must be enacted along with improved tools and procedures for measuring and monitoring silica. This includes the routine use of the Field Analysis of Silica (FAST) tool, in development by NOISH, to implement precise, consistent, field-based monitoring of silica in mines, as well as other specific strategies for inspection and enforcement focused specifically on reduced risk from silica.

Until MSHA sets and strictly enforces an evidence-based, silica-specific dust standard, along with improved procedures for measuring and monitoring silica, the agency will not be fulfilling its mission to "prevent death, illness and injury from mining and promote safe and healthful workplaces for U.S. miners."[15]

We thank MSHA for consideration of this comment.

Sincerely,

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13 https://www.cdc.gov/niosh/docs/2002-129/pdfs/2002-129.pdf
14 https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/aotsp.pdf
15 https://www.msha.gov/about/mission

Table 1. Mean Silica Exposure in Underground and Surface Coal Mines, 2010-2018

	All Mines (Underground and Surface)		**Underground**		**Surface**	
	# of samples	Mean silica dust (ug/m^3)	# of samples	Mean silica dust (ug/m^3)	# of samples	Mean silica dust (ug/m^3)
Designated Occupations	15888	36	15196	36	692	43
All except Designated Occupations	47470	25	40047	24	7423	34
All Occupations	**63358**	**28**	**55243**	**27**	**8115**	**35**

Table 2. MSHA Inspector Dust Samples from Underground Coal Mines Exceeding OSHA and MSHA Silica Standards, All Occupations, 2010-2018

	# of samples (n=55241)	**# of samples >OSHA PEL (50 ug/m^3)**	**% of samples >OSHA PEL (50 ug/m^3)**	**# of samples >1980 MSHA Standard (100 ug/m^3)**	**% of samples >1980 MSHA Standard (100 ug/m^3)**
2010	2487	911	37%	243	10%
2011	2229	720	32%	204	9%
2012	2245	741	33%	170	8%
2013	2027	631	31%	137	7%
2014	4226	696	16%	103	2%
2015	7118	703	10%	142	2%
2016	9633	623	6%	112	1%
2017	12341	785	6%	133	1%
2018	12935	721	6%	142	1%
Percent decrease since 2014 Final Rule (see text)		79%		84%	

Table 3. MSHA Inspector Dust Samples from Surface Coal Mines Exceeding OSHA and MSHA Silica Standards, All Occupations, 2010-2018

	# of samples (n=8115)	**# of samples >OSHA PEL (50 ug/m^3)**	**% of samples >OSHA PEL (50 ug/m^3)**	**# of samples >1980 MSHA Standard (100 ug/m^3)**	**% of samples >1980 MSHA Standard (100 ug/m^3)**
2010	485	236	49%	70	14%
2011	462	208	45%	70	15%
2012	453	206	45%	62	14%
2013	346	159	46%	40	12%
2014	912	160	18%	51	6%
2015	1636	165	10%	40	2%
2016	1222	142	12%	41	3%
2017	1378	164	12%	58	4%
2018	1221	119	10%	50	4%
Percent decrease since 2014 Final Rule (see text)		77%		74%	

Table 4. MSHA Inspector Dust Samples from Underground Coal Mines Exceeding OSHA and MSHA Silica Standards, Designated Occupations, 2010-2018

	# of samples (n=15196)	**# of samples >OSHA PEL (50 ug/m^3)**	**% of samples >OSHA PEL (50 ug/m^3)**	**# of samples >1980 MSHA Standard (100 ug/m^3)**	**% of samples >1980 MSHA Standard (100 ug/m^3)**
2010	1451	540	37%	163	11%
2011	1313	433	33%	127	10%
2012	1272	407	32%	97	8%
2013	1135	328	29%	75	7%
2014	1659	287	17%	48	3%
2015	2360	277	12%	68	3%
2016	1620	147	9%	38	2%
2017	2156	212	10%	43	2%
2018	2230	202	9%	51	2%
Percent decrease since 2014 Final Rule (see text)		70%		73%	

Table 5. MSHA Inspector Dust Samples from Surface Coal Mines Exceeding OSHA and MSHA Silica Standards, Designated Occupations, 2010-2018

	# of samples (n=692)	# of samples >OSHA PEL (50 ug/m^3)	% of samples >OSHA PEL (50 ug/m^3)	# of samples >1980 MSHA Standard (100 ug/m^3)	% of samples >1980 MSHA Standard (100 ug/m^3)
2010	148	43	29%	10	7%
2011	146	50	34%	16	11%
2012	113	36	32%	6	5%
2013	89	18	20%	2	2%
2014	93	16	17%	4	4%
2015	84	8	10%	0	0%
2016	13				
2017	4				
2018	2				

Figure 1. Silica Exposure in Underground Coal Mines, All Occupations, 2010-2018

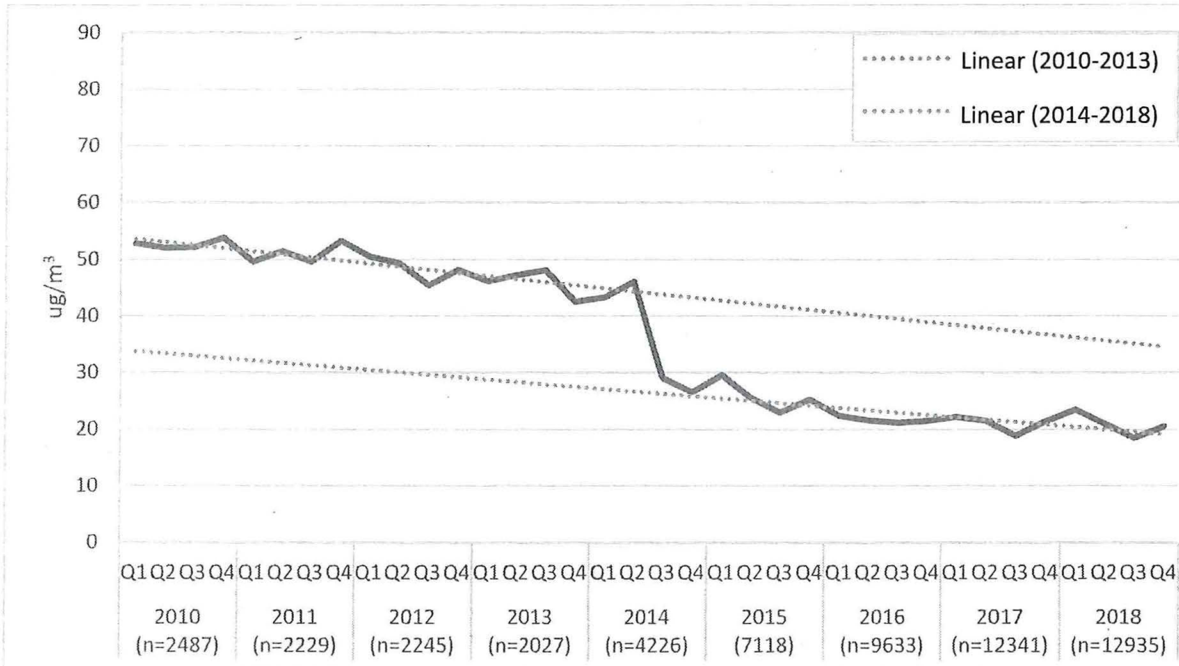

Figure 2. Silica Exposure in Surface Coal Mines, All Occupations, 2010-2018

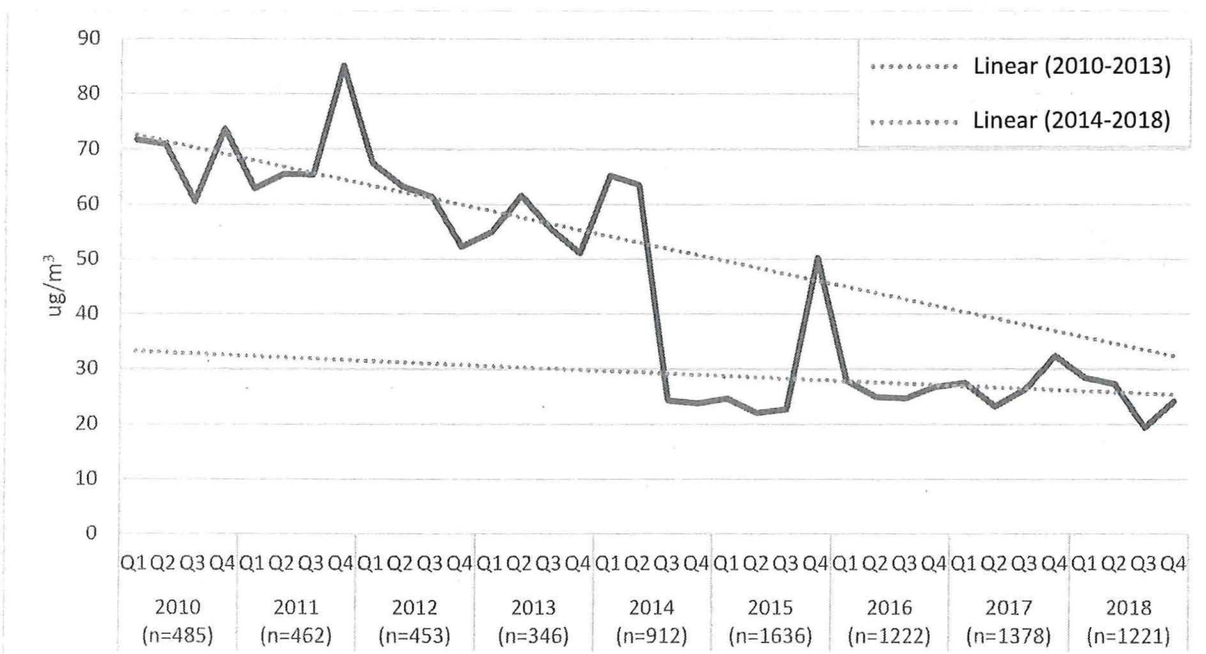

Figure 3. Silica Exposure in Underground Coal Mines, Designated Occupations, 2010-2018

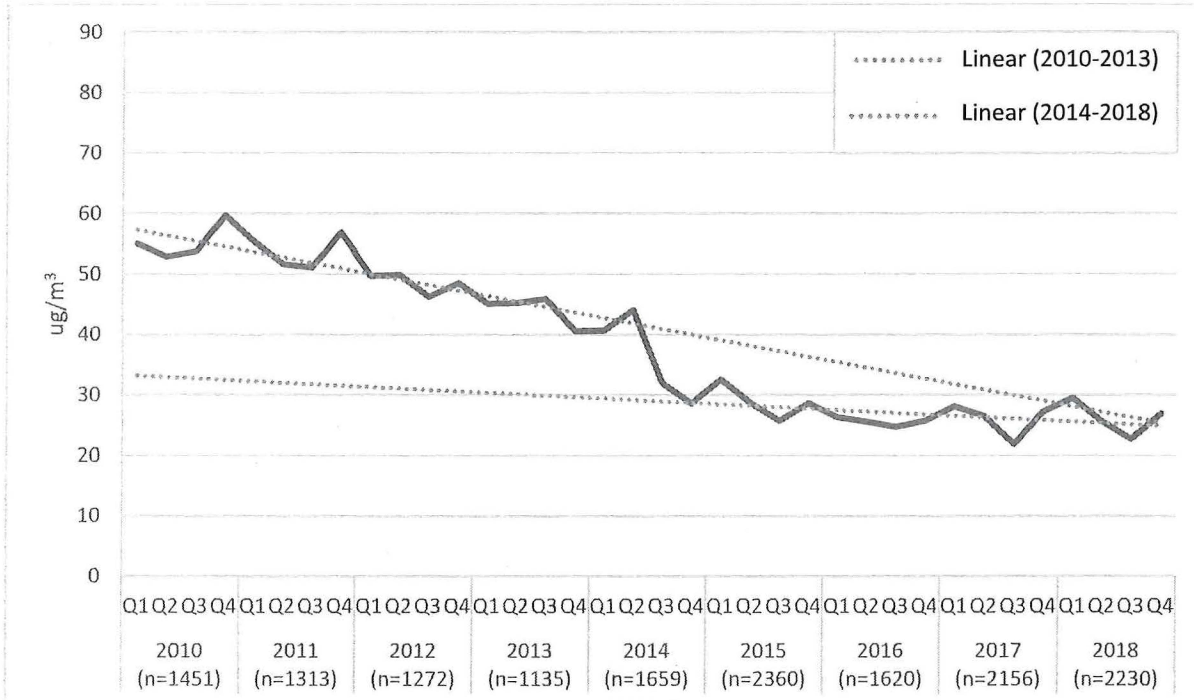

Figure 4. Silica Exposure in Surface Coal Mines, Designated Occupations, 2010-2015