

## Coal Workers' Pneumoconiosis: Coal Mine Dust Exposures

**Respirable coal mine dust: Geometric mean exposures and percent exceeding designated occupational exposure limits by type of mine, MSHA inspector and mine operator samples, 1979–2003**

NIOSH REL mg/m <sup>3</sup> MRE	Year	Underground Coal Mine Inspector Samples				Underground Coal Mine Operator Samples				Surface Coal Mine Inspector Samples				Surface Coal Mine Operator Samples			
		GM (mg/m <sup>3</sup> )	No. of Samples	PEL	% >	GM (mg/m <sup>3</sup> )	No. of Samples	PEL	% >	GM (mg/m <sup>3</sup> )	No. of Samples	PEL	% >	GM (mg/m <sup>3</sup> )	No. of Samples	PEL	% >
	1979	0.796	2,349	18.7	-	0.640	204,632	17.0	-	0.384	20	5.0	-	0.424	429	7.9	-
	1980	0.728	16,591	14.6	-	0.554	237,484	15.5	-	0.551	112	17.0	-	0.299	394	5.3	-
	1981	0.635	17,459	11.3	-	0.599	39,767	14.3	-	0.292	12,238	3.5	-	0.381	8,300	5.2	-
	1982	0.657	17,905	10.4	-	0.554	88,599	12.4	-	0.304	9,075	3.7	-	0.351	18,071	4.9	-
	1983	0.575	17,973	9.5	-	0.496	91,520	10.2	-	0.300	8,299	4.5	-	0.363	13,619	5.8	-
	1984	0.625	17,873	11.4	-	0.499	95,560	10.1	-	0.302	8,344	5.2	-	0.376	12,660	5.6	-
	1985	0.588	17,982	10.1	-	0.486	89,309	9.5	-	0.292	8,169	3.6	-	0.371	9,631	5.2	-
	1986	0.625	16,657	11.0	-	0.510	84,261	10.1	-	0.317	7,310	4.1	-	0.422	7,512	6.3	-
	1987	0.673	16,083	11.1	-	0.519	78,782	10.3	-	0.322	6,868	4.1	-	0.423	6,391	6.5	-
	1988	0.637	16,548	10.3	-	0.514	74,204	9.1	-	0.353	7,000	4.9	-	0.425	6,036	5.6	-
	1989	0.603	15,041	9.7	-	0.497	71,797	8.7	-	0.299	6,656	3.7	-	0.398	5,482	5.5	-
	1990	0.563	13,922	8.6	-	0.491	71,243	8.1	-	0.299	6,663	3.4	-	0.367	5,141	4.5	-
	1991	0.685	12,170	10.8	-	0.607	67,682	11.4	-	0.311	3,907	3.1	-	0.416	4,539	6.4	-
	1992	0.682	11,248	9.9	-	0.608	62,405	10.6	-	0.308	4,223	3.5	-	0.446	3,714	6.1	-
	1993	0.600	9,825	7.5	-	0.605	55,970	10.5	-	0.262	5,740	2.5	-	0.457	4,370	6.8	-
	1994	0.624	10,457	8.3	-	0.548	52,634	10.2	-	0.258	6,335	2.2	-	0.386	4,766	5.4	-
	1995	0.643	11,998	8.6	30.4	0.538	47,413	9.9	30.6	0.238	5,953	1.7	6.8	0.353	4,188	3.8	16.2
	1996	0.664	11,939	8.3	33.3	0.525	42,850	9.1	29.9	0.238	6,600	1.2	6.6	0.307	4,445	2.8	14.4
	1997	0.666	16,607	7.8	32.5	0.500	41,916	8.7	28.5	0.247	7,595	1.1	6.6	0.294	4,396	2.4	12.8
	1998	0.565	23,797	6.5	26.4	0.515	40,691	9.1	29.7	0.194	9,341	1.0	5.4	0.274	4,170	2.2	12.4
	1999	0.572	33,562	5.3	26.7	0.590	36,558	9.3	32.2	0.187	10,381	1.0	6.0	0.325	4,205	3.5	15.5
	2000	0.555	30,747	5.1	25.2	0.582	32,727	8.5	31.7	0.189	9,815	1.1	5.6	0.360	4,032	2.9	16.3
	2001	0.534	31,557	4.9	24.1	0.475	33,748	8.8	29.7	0.191	10,091	1.0	5.6	0.291	3,842	2.7	14.7
	2002	0.507	25,595	4.5	23.0	0.473	30,994	7.7	27.7	0.153	9,621	0.9	4.5	0.258	3,155	2.3	12.7
	2003	0.468	23,906	3.2	20.2	0.458	28,414	6.6	25.6	0.148	8,350	0.8	4.3	0.285	2,220	3.1	14.9

- indicates incalculable field. PEL - permissible exposure limit REL - recommended exposure limit GM - geometric mean mg/m<sup>3</sup> - milligrams per cubic meter  
MRE - Mining Research Establishment MSHA - Mine Safety and Health Administration  
NOTE: In coal mining, for respirable dust containing less than or equal to 5% quartz, the MSHA PEL is 2 mg/m<sup>3</sup> MRE; for respirable dust containing greater than 5% quartz, the MSHA PEL is [(10 mg/m<sup>3</sup> MRE) / (% quartz)]. The NIOSH REL of 1 mg/m<sup>3</sup> MRE for respirable coal mine dust was adopted in September of 1995. Geometric means are reported in MRE equivalent. All samples are compared to the MSHA PEL of 2 mg/m<sup>3</sup> MRE for respirable coal mine dust containing less than or equal to 5% quartz, regardless of actual quartz content. See appendices for source description, methods, and agents.  
SOURCE: MSHA coal mine inspector and mine operator dust data.