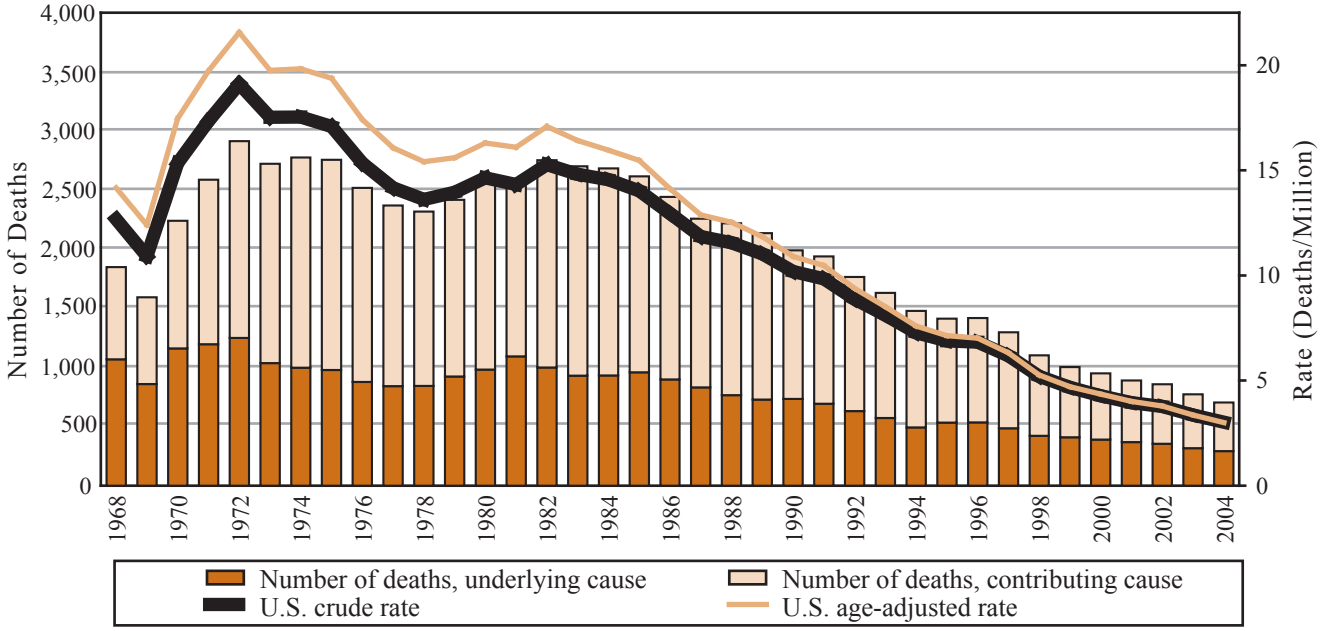
Section 2

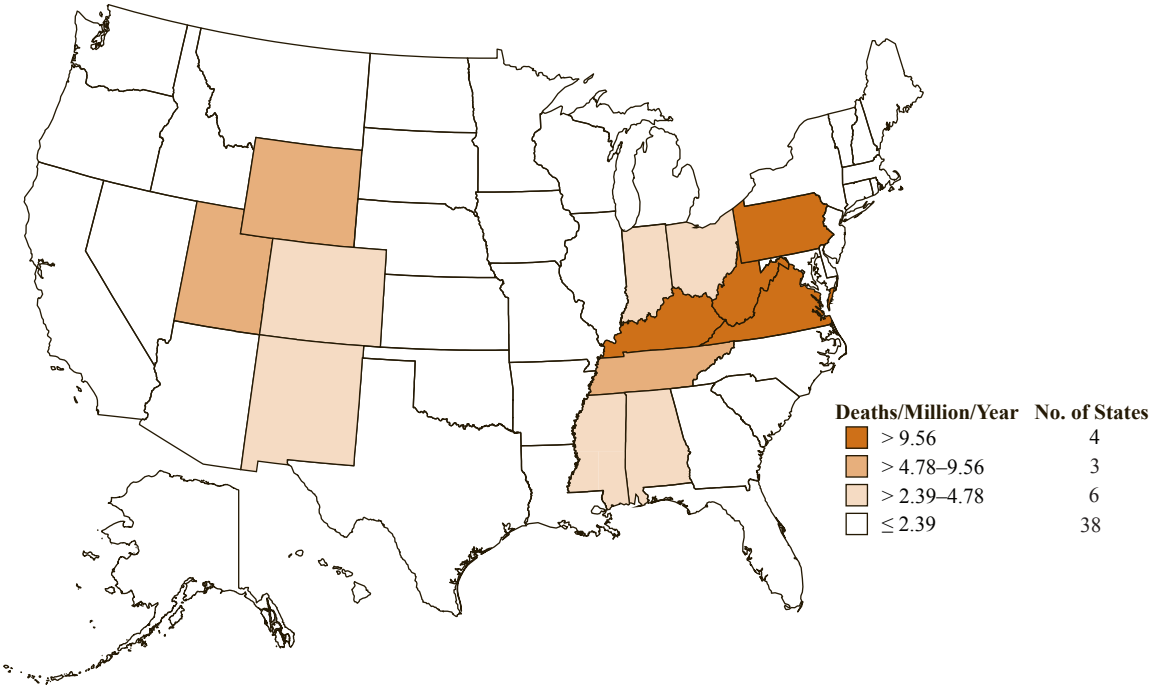
Coal Workers' Pneumoconiosis and Related Exposures

Figure 2-1. Coal workers' pneumoconiosis: Number of deaths, crude and age-adjusted death rates, U.S. residents age 15 and over, 1968–2004



NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data. Population estimates from U.S. Census Bureau.

Figure 2-2. Coal workers' pneumoconiosis: Age-adjusted death rates by state, U.S. residents age 15 and over, 1995–2004



NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data. Population estimates from U.S. Census Bureau.

Table 2-1. Coal workers' pneumoconiosis: Number of deaths by sex, race, and age, and median age at death, U.S. residents age 15 and over, 1995–2004

Year	No. of Deaths	Underlying Cause (%)	Sex		Race			Age Group (yrs)								Median Age (yrs)
			Male	Female	White	Black	Other	15–24	25–34	35–44	45–54	55–64	65–74	75–84	85+	
1995	1,413	37.7	1,407	6	1,372	41	-	-	3	4	28	75	354	614	335	79
1996	1,417	37.8	1,407	10	1,375	39	3	-	-	4	22	51	327	673	340	79
1997	1,297	37.5	1,283	14	1,267	30	-	-	2	7	24	54	266	623	321	80
1998	1,103	38.2	1,093	10	1,066	35	2	-	1	4	15	51	235	503	294	80
1999	1,003	40.9	998	5	971	31	1	-	1	3	10	52	174	459	304	81
2000	950	41.1	940	10	924	25	1	2	1	7	18	42	171	382	327	81
2001	889	41.4	878	11	865	23	1	2	-	8	19	41	159	374	286	81
2002	858	41.3	847	11	837	20	1	1	3	5	18	43	124	370	294	81
2003	773	41.1	765	8	746	26	1	1	3	4	19	48	109	341	248	81
2004	703	41.5	691	12	682	19	2	-	4	10	24	34	101	270	260	81
TOTAL	**10,406**	**39.5**	**10,309**	**97**	**10,105**	**289**	**12**	**6**	**18**	**56**	**197**	**491**	**2,020**	**4,609**	**3,009**	**80**

- indicates no deaths listed.
NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data.

Table 2-2. Coal workers' pneumoconiosis: Death rates (per million population) by race and sex, U.S. residents age 15 and over, 1995–2004

		White		Black		Other	
Year	Overall	Male	Female	Male	Female	Male	Female
				Crude Death Rate			
1995	6.89	16.35	0.07	3.68	-	-	-
1996	6.83	16.15	0.10	3.43	-	0.46	0.21
1997	6.18	14.71	0.12	2.33	0.22	-	-
1998	5.20	12.31	0.09	2.89	0.07	0.22	0.20
1999	4.68	11.14	0.05	2.59	-	0.21	-
2000	4.28	10.20	0.11	2.01	-	0.18	-
2001	3.95	9.41	0.12	1.82	-	0.17	-
2002	3.77	9.01	0.10	1.47	0.07	0.17	-
2003	3.36	7.98	0.07	1.91	0.07	0.16	-
2004	3.02	7.16	0.11	1.35	0.07	0.31	-
1995–2004	**4.69**	**11.18**	**0.09**	**2.27**	**0.05**	**0.18**	**0.03**
				Age-Adjusted Death Rate			
1995	7.14	20.72	0.05	7.88	-	-	-
1996	7.02	20.30	0.09	7.25	-	1.30	0.42
1997	6.32	18.32	0.11	4.96	0.31	-	-
1998	5.26	14.98	0.07	5.96	0.09	0.49	0.40
1999	4.71	13.57	0.05	5.41	-	0.46	-
2000	4.36	12.86	0.09	4.40	-	0.43	-
2001	4.01	11.58	0.11	4.11	-	0.17	-
2002	3.79	11.00	0.10	3.19	0.08	0.38	-
2003	3.36	9.53	0.07	3.70	0.09	0.35	-
2004	3.00	8.53	0.09	3.05	0.06	0.33	-
1995–2004	**4.78**	**13.81**	**0.08**	**4.98**	**0.06**	**0.37**	**0.07**

- indicates no deaths listed.
NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data. Population estimates from U.S. Census Bureau.

Table 2-3. Coal workers' pneumoconiosis: Years of potential life lost to age 65 and to life expectancy by race and sex, U.S. residents age 15 and over, 1995–2004

Year	White		Black		Other		Total
	Male	Female	Male	Female	Male	Female	
	Years of Potential Life Lost to Age 65						
1995	960	5	35	-	-	-	1,000
1996	650	30	5	-	-	-	685
1997	815	55	5	-	-	-	875
1998	580	-	35	-	-	-	615
1999	410	50	60	-	-	-	520
2000	720	45	15	-	-	-	780
2001	625	100	30	-	25	-	780
2002	590	140	25	5	-	-	760
2003	605	125	45	-	-	-	775
2004	830	35	10	15	30	-	920
TOTAL	**6,785**	**585**	**265**	**20**	**55**	**-**	**7,710**
	Years of Potential Life Lost to Life Expectancy						
1995	12,663	66	331	-	-	-	13,060
1996	12,135	124	296	-	15	8	12,578
1997	11,389	201	208	25	-	-	11,823
1998	9,563	94	296	14	9	6	9,982
1999	8,403	126	285	-	9	-	8,823
2000	8,314	166	211	-	9	-	8,700
2001	7,878	269	196	-	39	-	8,382
2002	7,457	306	175	22	9	-	7,969
2003	7,029	235	271	10	9	-	7,554
2004	6,712	177	152	30	62	-	7,133
TOTAL	**91,543**	**1,764**	**2,421**	**101**	**161**	**14**	**96,004**

- indicates no deaths listed.
NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data.

Table 2-4. Coal workers' pneumoconiosis: Number of deaths by state, U.S. residents age 15 and over, 1995–2004

State	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Alabama	15	14	15	13	8	6	8	7	11	9	**106**
Alaska	-	-	-	-	1	-	-	-	-	-	**1**
Arizona	6	7	2	1	4	3	4	4	1	2	**34**
Arkansas	3	5	4	3	7	2	6	5	3	3	**41**
California	13	12	4	17	8	8	4	7	3	2	**78**
Colorado	10	7	11	8	9	10	6	9	6	7	**83**
Connecticut	1	-	-	1	1	1	2	-	-	1	**7**
Delaware	-	-	2	-	-	-	-	-	-	1	**3**
District of Columbia	1	-	-	-	-	-	-	-	1	-	**2**
Florida	21	28	23	14	16	11	12	13	17	11	**166**
Georgia	5	3	3	1	2	7	1	4	1	-	**27**
Hawaii	-	-	-	-	-	-	-	-	-	-	**-**
Idaho	-	1	2	2	1	-	-	-	-	-	**6**
Illinois	36	41	39	26	24	14	15	10	12	11	**228**
Indiana	19	16	22	22	12	11	12	11	11	5	**141**
Iowa	4	7	4	3	4	5	2	2	3	1	**35**
Kansas	6	4	1	2	1	-	1	1	-	1	**17**
Kentucky	84	129	99	90	90	69	70	71	86	75	**863**
Louisiana	1	2	2	1	1	2	2	5	5	3	**24**
Maine	-	-	-	-	-	-	-	-	-	1	**1**
Maryland	7	8	7	11	7	2	4	3	3	2	**54**
Massachusetts	-	-	-	1	-	-	-	-	-	-	**1**
Michigan	6	10	9	7	6	9	7	8	4	2	**68**
Minnesota	-	-	-	-	-	-	1	1	1	1	**4**
Mississippi	6	1	7	6	6	15	17	10	12	16	**96**
Missouri	3	1	2	2	3	3	2	1	1	2	**20**
Montana	3	2	2	-	-	1	-	-	1	-	**9**
Nebraska	-	-	1	1	-	-	1	-	-	-	**3**
Nevada	-	1	-	-	1	-	-	-	-	1	**3**
New Hampshire	-	-	1	-	-	1	1	-	-	-	**3**
New Jersey	8	8	4	5	4	2	2	1	3	3	**40**
New Mexico	5	7	5	5	4	6	2	6	5	2	**47**
New York	1	4	4	2	6	5	10	5	3	1	**41**
North Carolina	15	9	4	6	9	9	8	7	4	9	**80**
North Dakota	-	-	1	-	-	-	-	-	-	-	**1**
Ohio	71	64	41	52	31	43	31	30	24	19	**406**
Oklahoma	4	1	5	2	2	3	2	2	1	4	**26**
Oregon	1	1	1	1	1	-	-	-	2	-	**7**
Pennsylvania	592	622	550	464	409	387	348	314	294	254	**4,234**
Rhode Island	-	1	-	-	-	-	-	-	-	-	**1**
South Carolina	4	3	1	5	2	4	1	1	-	-	**21**
South Dakota	-	-	1	-	-	-	-	-	-	1	**2**
Tennessee	30	25	19	23	26	15	23	18	12	17	**208**
Texas	2	8	6	2	7	8	5	2	12	6	**58**
Utah	13	6	8	9	5	7	6	7	5	10	**76**
Vermont	1	-	-	-	-	-	-	-	-	-	**1**
Virginia	118	124	129	82	86	71	94	113	75	81	**973**
Washington	3	5	6	4	-	2	-	4	-	-	**24**
West Virginia	291	228	245	207	196	205	175	175	146	137	**2,005**
Wisconsin	1	-	3	1	1	1	2	-	3	-	**12**
Wyoming	3	2	2	1	2	2	2	1	2	2	**19**
TOTAL	**1,413**	**1,417**	**1,297**	**1,103**	**1,003**	**950**	**889**	**858**	**773**	**703**	**10,406**

- indicates no deaths listed. NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes. SOURCE: National Center for Health Statistics multiple cause-of-death data.

Table 2-5. Coal workers' pneumoconiosis: Number of deaths, death rates (per million population), and years of potential life lost (YPLL) by state, U.S. residents age 15 and over, 1995–2004

State	No. of Deaths	Rank	Death Rate				YPLL to Life Expectancy			
			Crude	Rank	Age-Adjusted	Rank	Total	Rank	YPLL/death	Rank
Alabama	106	10	3.00	11	3.01	12	1,055	11	10.0	25
Alaska	1	45	0.21	43	0.73	25	6	49	6.3	49
Arizona	34	24	0.86	23	0.87	23	281	28	8.3	41
Arkansas	41	20	1.94	15	1.77	15	442	21	10.8	19
California	78	14	0.30	37	0.34	36	932	13	11.9	11
Colorado	83	12	2.45	13	3.25	11	789	14	9.5	32
Connecticut	7	35	0.26	40	0.23	43	73	35	10.4	21
Delaware	3	39	0.48	30	0.50	32	30	40	9.9	26
District of Columbia	2	43	0.42	32	0.46	33	17	44	8.7	39
Florida	166	8	1.29	17	0.97	20	1,642	9	9.9	26
Georgia	27	25	0.42	32	0.55	31	303	25	11.2	15
Hawaii	-	-	-	-	-	-	-	-	-	-
Idaho	6	37	0.60	27	0.64	28	84	34	14.0	9
Illinois	228	6	2.34	14	2.39	14	2,294	7	10.1	24
Indiana	141	9	2.95	12	3.01	12	1,369	10	9.7	29
Iowa	35	23	1.49	16	1.16	19	285	27	8.2	44
Kansas	17	32	0.80	24	0.79	24	296	26	17.4	5
Kentucky	863	4	26.49	3	27.70	3	10,088	4	11.7	12
Louisiana	24	27	0.69	25	0.72	26	582	18	24.2	2
Maine	1	45	0.10	48	0.08	49	7	48	6.8	48
Maryland	54	18	1.29	17	1.47	16	518	19	9.6	30
Massachusetts	1	45	0.02	50	0.02	50	14	45	14.3	8
Michigan	68	16	0.87	22	0.90	22	705	16	10.4	21
Minnesota	4	38	0.10	48	0.11	47	67	37	16.8	6
Mississippi	96	11	4.33	9	4.43	8	3,170	6	33.0	1
Missouri	20	30	0.45	31	0.42	35	223	31	11.1	16
Montana	9	34	1.24	20	1.17	18	67	37	7.5	47
Nebraska	3	39	0.22	42	0.20	45	24	42	7.9	45
Nevada	3	39	0.19	45	0.26	41	30	40	9.9	26
New Hampshire	3	39	0.31	36	0.33	37	24	42	7.9	45
New Jersey	40	22	0.60	27	0.57	29	364	23	9.1	34
New Mexico	47	19	3.34	10	3.77	10	391	22	8.3	41
New York	41	20	0.27	39	0.27	39	465	20	11.3	14
North Carolina	80	13	1.25	19	1.39	17	760	15	9.5	32
North Dakota	1	45	0.19	45	0.17	46	9	46	8.5	40
Ohio	406	5	4.52	8	4.36	9	3,660	5	9.0	37
Oklahoma	26	26	0.95	21	0.93	21	326	24	12.5	10
Oregon	7	35	0.26	40	0.25	42	73	35	10.4	21
Pennsylvania	4,234	1	42.81	2	34.79	2	38,400	1	9.1	34
Rhode Island	1	45	0.12	47	0.09	48	6	49	6.1	50
South Carolina	21	29	0.65	26	0.71	27	234	29	11.1	16
South Dakota	2	43	0.34	35	0.33	37	48	39	23.9	3
Tennessee	208	7	4.58	7	4.84	7	2,232	8	10.7	20
Texas	58	17	0.36	34	0.43	34	1,022	12	17.6	4
Utah	76	15	4.59	6	6.53	5	685	17	9.0	37
Vermont	1	45	0.20	44	0.21	44	8	47	8.3	41
Virginia	973	3	17.24	4	19.82	4	11,191	3	11.5	13
Washington	24	27	0.52	29	0.56	30	231	30	9.6	30
West Virginia	2,005	2	135.40	1	118.37	1	21,865	2	10.9	18
Wisconsin	12	33	0.28	38	0.27	39	181	32	15.1	7
Wyoming	19	31	4.83	5	5.40	6	173	33	9.1	34

- indicates no deaths listed.

NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.

SOURCE: National Center for Health Statistics multiple cause-of-death data. Population estimates from U.S. Census Bureau.

Table 2-6. Coal workers' pneumoconiosis: Most frequently recorded industries on death certificate, U.S. residents age 15 and over, selected states and years, 1990–1999

CIC	Industry	Number of Deaths	Percent
041	Coal mining	3,765	77.0
060	Construction	188	3.8
270	Blast furnaces, steelworks, rolling and finishing mills	56	1.1
392	Not specified manufacturing industries	48	1.0
400	Railroads	39	0.8
010	Agricultural production, crops	35	0.7
351	Motor vehicles and motor vehicle equipment	30	0.6
410	Trucking service	29	0.6
040	Metal mining	25	0.5
961	Non-paid worker or non-worker or own home/at home	24	0.5
	All other industries	461	9.4
	Industry not reported	193	3.9
	TOTAL	**4,893**	**100.0**

CIC - Census Industry Code
NOTE: The comparable number of coal workers' pneumoconiosis deaths in the entire United States for this same time period was 15,036. Percentages may not total to 100% due to rounding. See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, ICD codes, industry and occupation codes, and list of selected states and years.
SOURCE: National Center for Health Statistics multiple cause-of-death data.

Table 2-7. Coal workers' pneumoconiosis: Most frequently recorded occupations on death certificate, U.S. residents age 15 and over, selected states and years, 1990–1999

COC	Occupation	Number of Deaths	Percent
616	Mining machine operators	3,440	70.3
889	Laborers, except construction	147	3.0
575	Electricians	64	1.3
804	Truck drivers	63	1.3
019	Managers and administrators, n.e.c.	59	1.2
613	Supervisors, extractive occupations	49	1.0
567	Carpenters	48	1.0
453	Janitors and cleaners	47	1.0
869	Construction laborers	45	0.9
473	Farmers, except horticulture	39	0.8
844	Operating engineers	39	0.8
	All other occupations	654	13.4
	Occupation not reported	199	4.1
	TOTAL	**4,893**	**100.0**

COC - Census Occupation Code n.e.c. - not elsewhere classified
NOTE: The comparable number of coal workers' pneumoconiosis deaths in the entire United States for this same time period was 15,036. Percentages may not total to 100% due to rounding. See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, ICD codes, industry and occupation codes, and list of selected states and years.
SOURCE: National Center for Health Statistics multiple cause-of-death data.

Table 2-8. Coal workers' pneumoconiosis: Proportionate mortality ratio (PMR) adjusted for age, sex, and race by usual industry, U.S. residents age 15 and over, selected states and years, 1990–1999

CIC	Industry	Number of Deaths	PMR	95% Confidence Interval	
				LCL	UCL
041	Coal mining	3,765	53.2	51.5	54.9
040	Metal mining	25	2.0	1.3	2.9

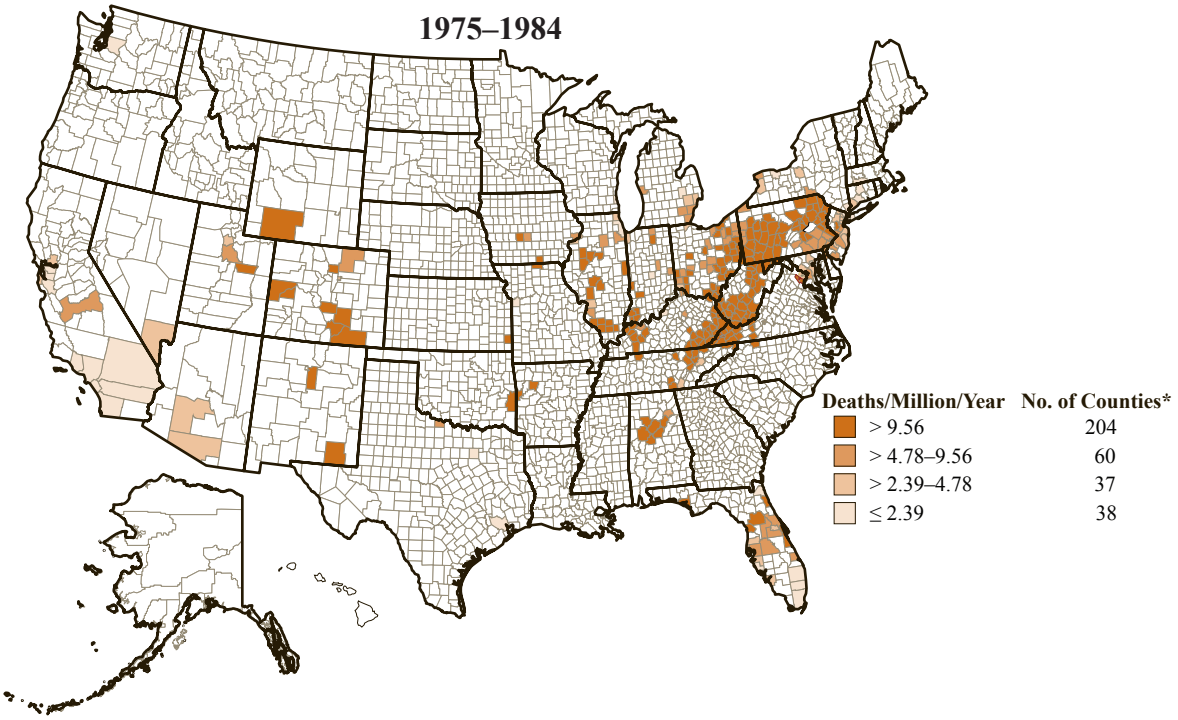
CIC - Census Industry Code LCL - lower confidence limit UCL - upper confidence limit
NOTE: The total number of deaths with coal workers' pneumoconiosis reported was 4,893 in these same selected states and years, and the comparable number of coal workers' pneumoconiosis deaths in the entire United States for this same time period was 15,036. See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, ICD codes, industry and occupation codes, and list of selected states and years.
SOURCE: National Center for Health Statistics multiple cause-of-death data.

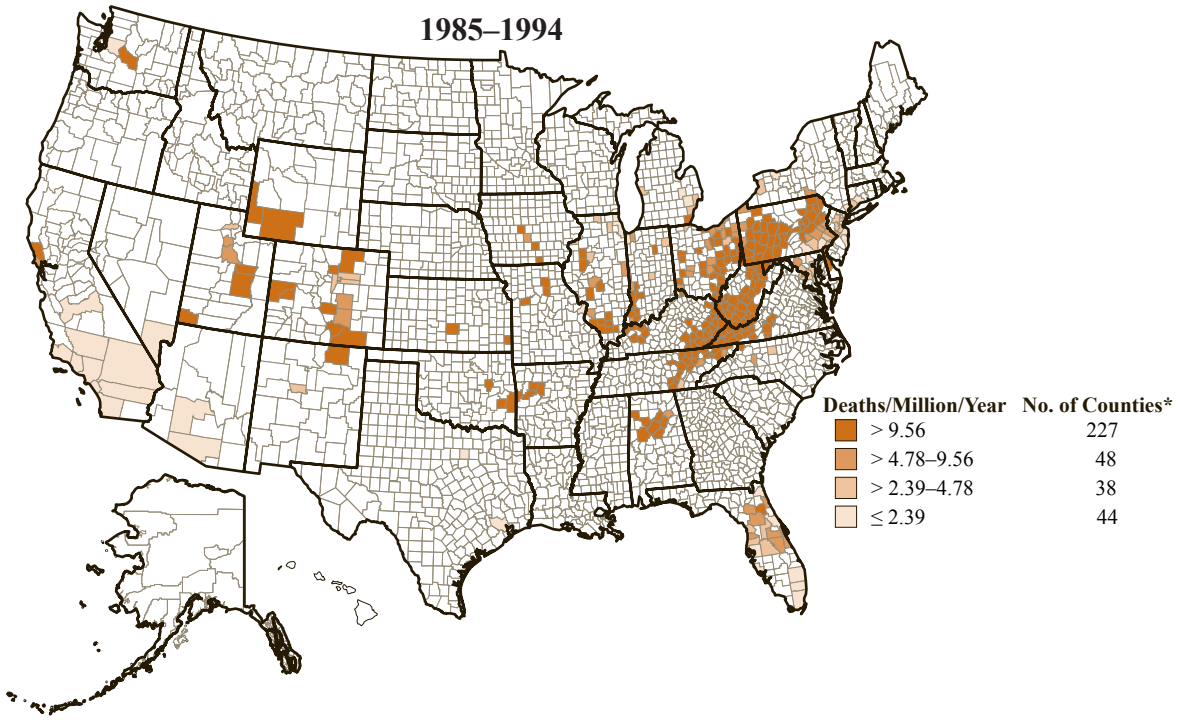
Table 2-9. Coal workers' pneumoconiosis: Proportionate mortality ratio (PMR) adjusted for age, sex, and race by usual occupation, U.S. residents age 15 and over, selected states and years, 1990–1999

COC	Occupation	Number of Deaths	PMR	95% Confidence Interval	
				LCL	UCL
616	Mining machine operators	3,440	51.7	50.0	53.4
613	Supervisors, extractive occupations	49	14.4	10.6	19.0
046	Mining engineers	8	6.0	2.6	11.9
617	Mining occupations, n.e.c.	14	4.5	2.4	7.5
859	Miscellaneous material moving equipment operators	12	2.3	1.2	4.0
824	Locomotive operating occupations	23	2.0	1.3	3.1

COC - Census Occupation Code n.e.c. - not elsewhere classified LCL - lower confidence limit UCL - upper confidence limit
NOTE:The total number of deaths with coal workers' pneumoconiosis reported was 4,893 in these same selected states and years, and the comparable number of coal workers' pneumoconiosis deaths in the entire United States for this same time period was 15,036. See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, ICD codes, industry and occupation codes, and list of selected states and years.
SOURCE: National Center for Health Statistics multiple cause-of-death data.

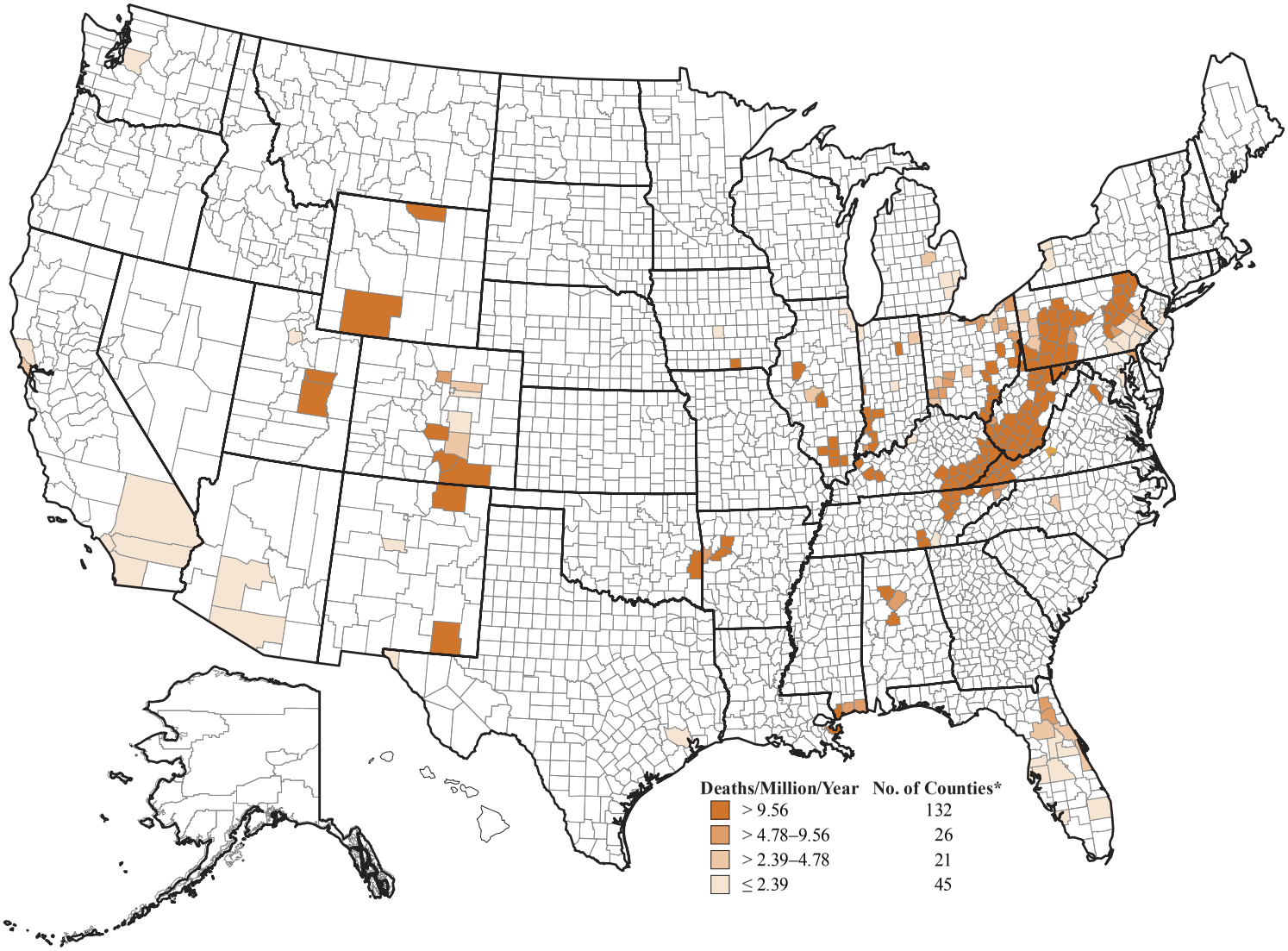
Figure 2-3a. Coal workers' pneumoconiosis: Age-adjusted death rates by county, U.S. residents age 15 and over, 1975–1984 and 1985–1994





*Age-adjusted rates have not been calculated for counties having less than 5 deaths with the disease of interest or for unincorporated counties (see Appendix H).
NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data. Population estimates from U.S. Census Bureau.

Figure 2-3b. Coal workers' pneumoconiosis: Age-adjusted death rates by county, U.S. residents age 15 and over, 1995–2004



*Age-adjusted rates have not been calculated for counties having less than 5 deaths with the disease of interest or for unincorporated counties (see Appendix H).
NOTE: See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data. Population estimates from U.S. Census Bureau.

Table 2-10. Coal workers' pneumoconiosis: Counties with highest age-adjusted death rates (per million population), U.S. residents age 15 and over, 1995–2004

County	State	Age-Adjusted Rate	Crude Rate	Number of Deaths	% Female
Buchanan County	Virginia	1,351.1	1,172.4	262	0.4
McDowell County	West Virginia	863.1	1,046.1	232	0.4
Wyoming County	West Virginia	729.5	726.2	153	0.7
Raleigh County	West Virginia	619.5	701.6	458	0.0
Schuylkill County	Pennsylvania	570.6	871.5	1,089	0.1
Tazewell County	Virginia	566.1	642.4	236	0.0
Floyd County	Kentucky	488.1	440.8	153	0.0
Logan County	West Virginia	433.6	445.6	138	0.7
Mingo County	West Virginia	403.6	380.2	86	1.2
Fayette County	West Virginia	401.6	494.7	194	0.0
Lee County	Virginia	371.2	433.7	83	1.2
Wise County	Virginia	359.0	353.8	123	0.0
Harlan County	Kentucky	350.1	375.7	100	1.0
Dickenson County	Virginia	321.3	348.5	47	0.0
Leslie County	Kentucky	287.5	268.7	27	0.0
Boone County	West Virginia	287.4	294.3	61	0.0
Knott County	Kentucky	269.1	243.8	35	0.0
Perry County	Kentucky	266.7	222.7	53	0.0
Russell County	Virginia	265.9	269.3	65	0.0
Luzerne County	Pennsylvania	265.6	416.0	1,101	0.2
Pike County	Kentucky	244.0	218.0	122	0.0
Webster County	West Virginia	240.1	277.9	22	0.0
Carbon County	Utah	232.4	253.7	40	0.0
Letcher County	Kentucky	231.7	217.4	45	0.0
Northumberland County	Pennsylvania	228.1	334.1	261	0.0
Mercer County	West Virginia	225.2	293.3	153	0.7
Martin County	Kentucky	215.6	172.5	17	0.0
Hancock County	Mississippi	210.1	212.5	73	21.9
Johnson County	Kentucky	204.4	194.3	37	0.0
Cambria County	Pennsylvania	185.9	278.1	352	0.3
Emery County	Utah	184.5	152.3	12	0.0
Nicholas County	West Virginia	183.7	203.6	44	2.3
Somerset County	Pennsylvania	174.7	244.9	161	0.0
Franklin County	Illinois	166.4	249.1	79	0.0
Greenbrier County	West Virginia	165.4	218.5	62	0.0
Bell County	Kentucky	150.5	156.3	38	0.0
Colfax County	New Mexico	143.6	191.9	22	0.0
Clay County	Kentucky	142.9	116.4	23	0.0
Norton City	Virginia	136.3	156.7	5	0.0
Huerfano County	Colorado	135.9	183.7	12	0.0
Carbon County	Pennsylvania	134.6	188.0	91	0.0
Fayette County	Pennsylvania	132.4	186.7	226	0.0
Preston County	West Virginia	129.1	146.6	35	0.0
Greene County	Pennsylvania	129.0	152.5	51	0.0
Clay County	West Virginia	125.5	134.0	11	0.0
Lincoln County	West Virginia	118.0	111.5	20	0.0
Muhlenberg County	Kentucky	114.3	133.6	35	0.0
Lackawanna County	Pennsylvania	109.9	175.7	308	0.0
Campbell County	Tennessee	99.9	108.0	35	0.0
Perry County	Ohio	97.1	91.5	24	0.0
Overall United States		**4.8**	**4.7**	**10,406**	**0.9**

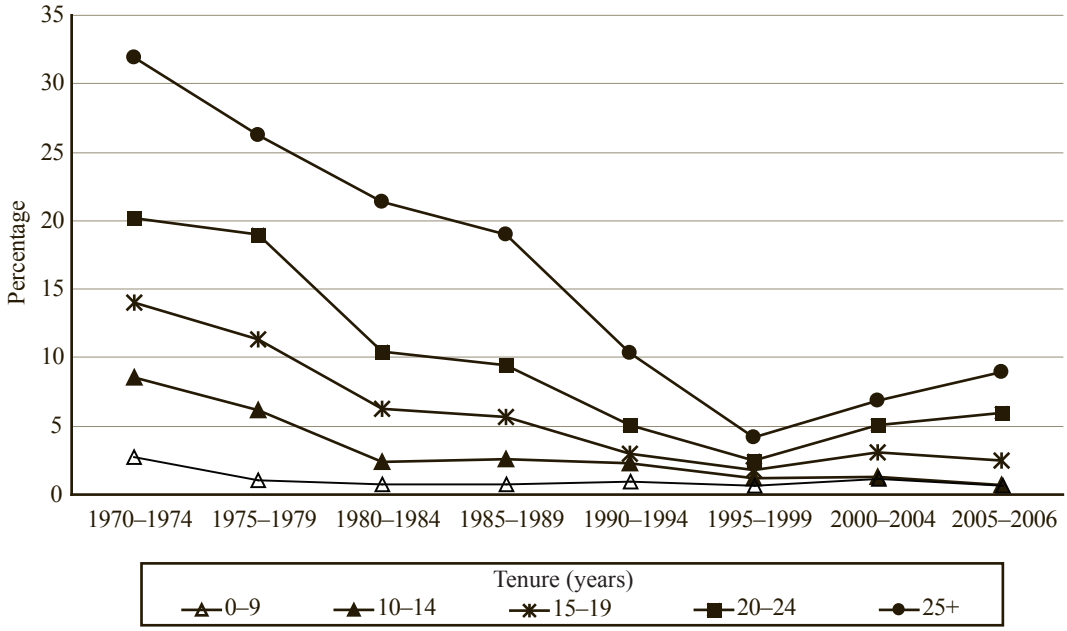
NOTE: Only counties with at least 5 deaths from the disease of interest are included. See selected limitations for general cautions regarding inferences based on small numbers of deaths, and see appendices for source description, methods, and ICD codes.
SOURCE: National Center for Health Statistics multiple cause-of-death data. Population estimates from U.S. Census Bureau.

Table 2-11. Coal workers' pneumoconiosis: Estimated number of discharges from short-stay non-federal hospitals, 1970–2004

Year	Number of Discharges
1970	6,000
1971	8,000
1972	11,000
1973	13,000
1974	14,000
1975	17,000
1976	18,000
1977	18,000
1978	13,000
1979	18,000
1980	17,000
1981	14,000
1982	17,000
1983	22,000
1984	23,000
1985	18,000
1986	16,000
1987	17,000
1988	15,000
1989	11,000
1990	7,000
1991	11,000
1992	10,000
1993	8,000
1994	9,000
1995	16,000
1996	11,000
1997	15,000
1998	8,000
1999	8,000
2000	10,000
2001	6,000
2002	9,000
2003	7,000
2004	5,000

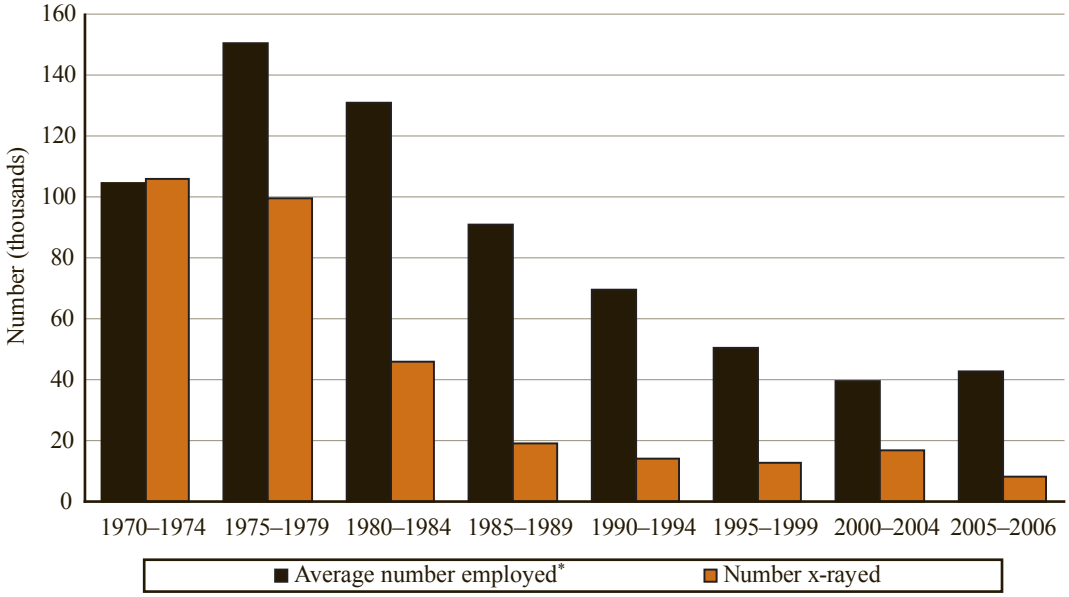
NOTE: Number of discharges has been rounded. The National Center for Health Statistics recommends that, in statistical comparisons, estimates of less than 5,000 not be used and that estimates of 5,000 to 10,000 be used with caution. See appendices for source description and methods.
SOURCE: National Center for Health Statistics National Hospital Discharge Survey.

Figure 2-4. CWXSP: Percentage of examined miners with coal workers' pneumoconiosis (category 1/0+) by tenure in mining, 1970–2006



NOTE: See appendices for source description and methods.
SOURCE: NIOSH Coal Workers' X-ray Surveillance Program (CWXSP).

Figure 2-5. CWXSP: Estimated number of actively employed workers at underground mines and number of miners examined, 1970–2006



* Average number employed during the period, based upon quarterly reports by coal mine operators to the Mine Safety and Health Administration (MSHA). Because of hiring and layoffs, the total number of individuals who worked at underground mines in any period exceeds the average employment.
NOTE: See appendices for source description and methods.
SOURCE: NIOSH Coal Workers' X-ray Surveillance Program (CWXSP). MSHA coal mine employment data.

Table 2-12. CWXSP: Number and percentage of examined employees at underground coal mines with coal workers' pneumoconiosis (ILO category 1/0+) by tenure, 1970–2006

	Tenure (years in mining)								
	0–4	5–9	10–14	15–19	20–24	25–29	30+	Unknown	Total
1970–1974									
Number of Miners Examined	26,850	11,123	6,125	5,665	7,621	8,345	16,208	23,904	105,841
Number with CWP	682	391	526	792	1,542	2,120	5,709	85	11,847
% with CWP	2.5	3.5	8.6	14.0	20.2	25.4	35.2	0.4	11.2
1975–1979									
Number of Miners Examined	28,146	15,417	5,386	2,657	2,018	1,771	3,471	40,744	99,610
Number with CWP	173	317	333	301	383	404	971	148	3,030
% with CWP	0.6	2.1	6.2	11.3	19.0	22.8	28.0	0.4	3.0
1980–1984									
Number of Miners Examined	10,638	12,591	7,009	2,215	979	724	1,555	10,086	45,797
Number with CWP	68	120	167	138	102	126	361	80	1,162
% with CWP	0.6	1.0	2.4	6.2	10.4	17.4	23.2	0.8	2.5
1985–1989									
Number of Miners Examined	2,047	3,886	4,341	2,065	680	257	390	5,383	19,049
Number with CWP	5	42	112	118	64	43	80	193	657
% with CWP	0.2	1.1	2.6	5.7	9.4	16.7	20.5	3.6	3.5
1990–1994									
Number of Miners Examined	1,693	1,288	2,937	3,992	2,305	585	307	1,176	14,283
Number with CWP	17	13	67	119	118	49	43	6	432
% with CWP	1.0	1.0	2.3	3.0	5.1	8.4	14.0	0.5	3.0
1995–1999									
Number of Miners Examined	1,444	858	1,167	2,338	3,437	1,858	515	1,057	12,674
Number with CWP	10	5	14	41	86	64	35	4	259
% with CWP	0.7	0.6	1.2	1.8	2.5	3.4	6.8	0.4	2.0
2000–2004									
Number of Miners Examined	3,134	1,124	1,205	1,408	3,084	3,219	1,475	1,995	16,644
Number with CWP	39	10	16	43	155	184	139	15	601
% with CWP	1.2	0.9	1.3	3.1	5.0	5.7	9.4	0.8	3.6
2005–2006									
Number of Miners Examined	2,151	577	442	436	603	975	1,217	1,800	8,201
Number with CWP	14	4	3	11	36	77	120	5	270
% with CWP	0.7	0.7	0.7	2.5	6.0	7.9	9.9	0.3	3.3

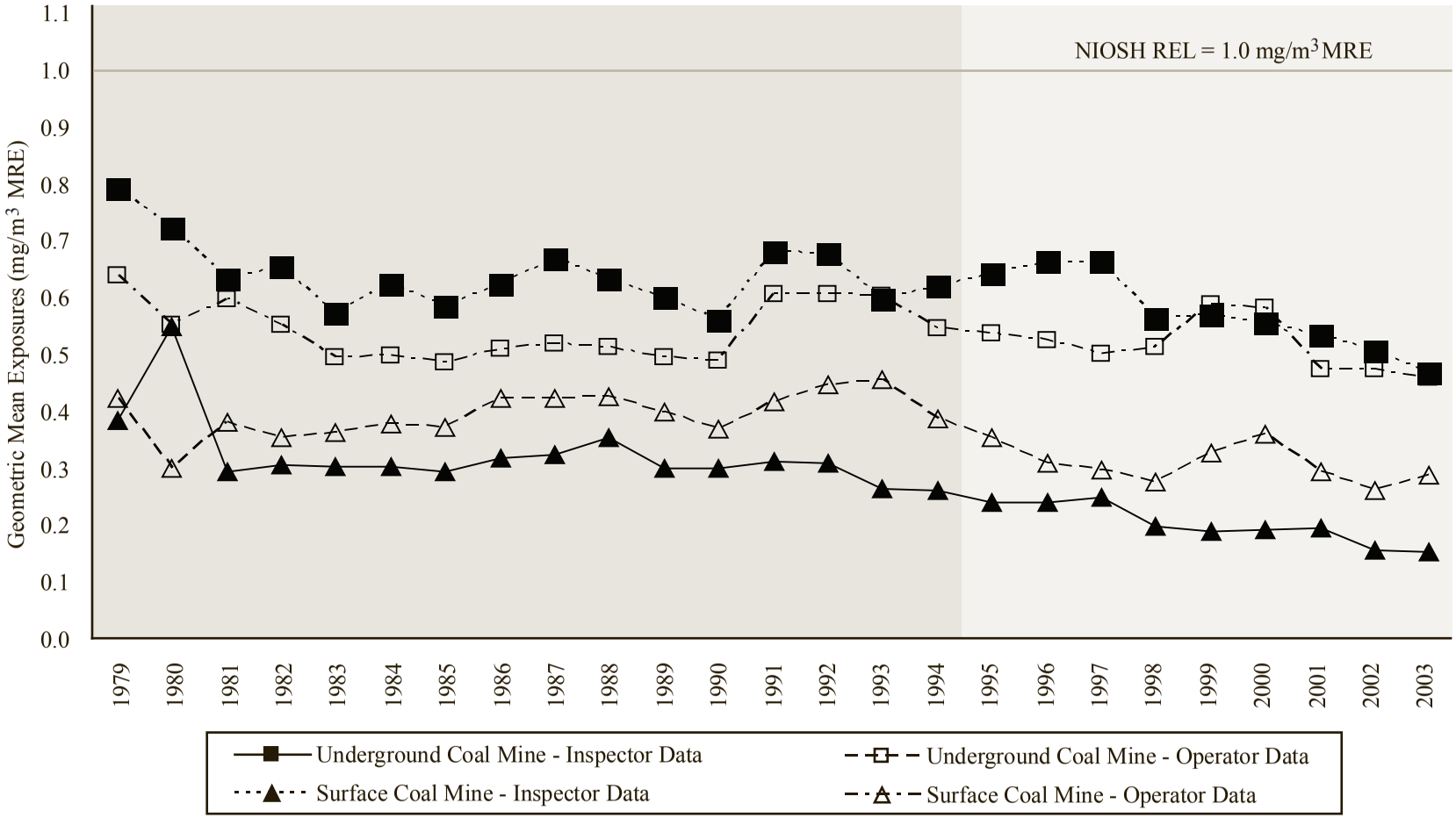
CWP - coal workers' pneumoconiosis ILO - International Labour Organization
NOTE: Tabulations are based on final determinations of one chest x-ray per period for each participating miner. See appendices for source description and methods.
SOURCE: NIOSH Coal Workers' X-ray Surveillance Program (CWXSP).

Table 2-13. Federal Black Lung Program: Number of beneficiaries and total payments by the Social Security Administration and Department of Labor, 1980–2005

	Social Security Administration (SSA)		Department of Labor (DOL)		All	
Year	Beneficiaries	Amount (dollars)	Beneficiaries	Amount (dollars)	Beneficiaries	Amount (dollars)
1980	399,477	1,032,000,000	139,073	813,205,000	538,550	1,845,205,000
1981	376,505	1,081,300,000	163,401	805,627,000	539,906	1,886,927,000
1982	354,569	1,076,000,000	173,972	784,085,000	528,541	1,860,085,000
1983	333,358	1,055,800,000	166,043	858,854,000	499,401	1,914,654,000
1984	313,822	1,038,000,000	163,166	873,932,000	476,988	1,911,932,000
1985	294,846	1,025,000,000	160,441	905,517,000	455,287	1,930,517,000
1986	275,783	971,000,000	156,892	629,075,000	432,675	1,600,075,000
1987	258,988	940,000,000	153,769	655,290,000	412,757	1,595,290,000
1988	241,626	904,000,000	150,123	656,689,000	391,749	1,560,689,000
1989	225,764	882,000,000	145,289	650,123,000	371,053	1,532,123,000
1990	210,678	863,400,000	139,854	626,521,000	350,532	1,489,921,000
1991	196,419	844,400,000	134,205	942,428,000	330,624	1,786,828,000
1992	182,396	822,500,000	128,761	973,636,000	311,157	1,796,136,000
1993	168,365	794,300,000	123,213	984,666,000	291,578	1,778,966,000
1994	155,122	751,900,000	117,569	994,655,000	272,691	1,746,555,000
1995	143,011	696,700,000	111,769	995,722,000	254,780	1,692,422,000
1996	131,143	654,600,000	105,923	992,128,000	237,066	1,646,728,000
1997	119,233	614,888,000	100,352	1,004,672,000	219,585	1,619,560,000
1998	109,271	576,389,000	94,488	999,822,000	203,759	1,576,211,000
1999	98,977	541,200,000	88,716	1,005,246,000	187,693	1,546,446,000
2000	91,596	522,147,000	82,910	422,656,000	174,506	944,803,000
2001	79,518	487,420,000	70,530	396,928,000	150,048	884,348,000
2002	73,593	453,862,000	65,747	384,234,000	139,340	838,096,000
2003	65,638	416,971,000	61,162	370,389,000	126,800	787,360,000
2004	58,598	379,829,000	56,719	346,864,000	115,317	726,693,000
2005	51,972	345,476,000	52,531	329,863,000	104,503	675,339,000

NOTE: The SSA was assigned initial responsibility for administering the Black Lung benefits program. The DOL assumed responsibility for processing and paying claims on July 1, 1973. Most claims filed prior to July 1, 1973 remain within the jurisdiction of SSA, which also continues to be responsible for processing and paying claims filed by the survivors of these miners. The dollar amounts from the DOL are for fiscal years. See appendices for source description.
SOURCE: Social Security Bulletin Annual Statistical Supplement (annual reports) and Black Lung Benefits Act Annual Report to Congress (annual reports).

Figure 2-6. Respirable coal mine dust: Geometric mean exposures by type of mine, MSHA inspector and mine operator samples, 1979–2003



PEL - permissible exposure limit REL - recommended exposure limit mg/m^3 - 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^3 MRE; for respirable dust containing greater than 5% quartz, the MSHA PEL is [(10 mg/m^3 MRE) / (% quartz)]. The NIOSH REL of 1 mg/m^3 MRE for respirable coal mine dust was adopted in September of 1995. Geometric means are reported in MRE equivalent. See appendices for source description, methods, and agents.
SOURCE: MSHA coal mine inspector and mine operator dust data.

Table 2-14. 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/m³ MRE	Year	Underground Coal Mine Inspector Samples				Underground Coal Mine Operator Samples				Surface Coal Mine Inspector Samples				Surface Coal Mine Operator Samples			
		GM (mg/m³)	No. of Samples	% > PEL	% > REL	GM (mg/m³)	No. of Samples	% > PEL	% > REL	GM (mg/m³)	No. of Samples	% > PEL	% > REL	GM (mg/m³)	No. of Samples	% > PEL	% > REL
No REL	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	-
1.0	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/m³ - 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/m³ MRE; for respirable dust containing greater than 5% quartz, the MSHA PEL is [(10 mg/m³ MRE) / (% quartz)]. The NIOSH REL of 1 mg/m³ 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/m³ 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.

Table 2-15. Respirable coal mine dust: Number of samples, geometric mean exposures, and percent exceeding designated occupational exposure limits by industry, MSHA inspector and mine operator and OSHA samples, 1995–2003

CIC	Industry	Number of Samples	GM (mg/m^3)	% > PEL	% > REL
041	Coal mining	657,419	0.458	6.5	24.6
	All other industries*	28	0.063	0.0	4.2
	TOTAL	**657,447**	**0.458**	**6.5**	**24.6**

CIC - Census Industry Code PEL - permissible exposure limit REL - recommended exposure limit GM - geometric mean
mg/m^3 - milligrams per cubic meter MRE - Mining Research Establishment MSHA - Mine Safety and Health Administration
OSHA - Occupational Safety and Health Administration
* includes industries with no samples exceeding the REL or industries with less than 10 samples.
NOTE: In coal mining, for respirable dust containing less than or equal to 5% quartz, the MSHA PEL is 2 mg/m^3 MRE; for respirable dust containing greater than 5% quartz, the MSHA PEL is [(10 mg/m^3 MRE) / (% quartz)]. The NIOSH REL of 1 mg/m^3 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^3 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 industry codes.
SOURCE: MSHA coal mine inspector and mine operator dust data. OSHA Integrated Management Information System.

Table 2-16 (page 1 of 3). Respirable coal mine dust: Geometric mean exposures and percent exceeding designated occupational exposure limits by MSHA coal mine district and state, MSHA inspector and mine operator samples, 1979–2003

	All years		1979–1989			1990–1994			1995–2003			
MSHA Coal Mine District	No. of Samples	GM (mg/m^3)	No. of Samples	GM (mg/m^3)	% > PEL	No. of Samples	GM (mg/m^3)	% > PEL	No. of Samples	GM (mg/m^3)	% > PEL	% > REL
District 1 (Anthracite coal mining regions in Pennsylvania)	**47,537**	**0.202**	**22,699**	**0.218**	**2.7**	**9,269**	**0.184**	**2.4**	**15,569**	**0.191**	**2.6**	**9.6**
District 2 (Bituminous coal mining regions in Pennsylvania)	**315,887**	**0.499**	**208,477**	**0.514**	**9.7**	**39,729**	**0.559**	**9.3**	**67,681**	**0.427**	**5.1**	**22.3**
District 3	**278,414**	**0.553**	**183,654**	**0.591**	**12.7**	**37,586**	**0.532**	**7.5**	**57,174**	**0.458**	**5.2**	**24.3**
Maryland	11,559	0.589	5,655	0.677	13.1	1,496	0.617	6.8	4,408	0.485	5.0	30.0
Ohio	92,171	0.592	66,363	0.672	16.3	9,714	0.476	5.8	16,094	0.401	4.9	23.6
Northern West Virginia	174,684	0.531	111,636	0.543	10.5	26,376	0.550	8.1	36,672	0.482	5.3	23.9
District 4 (Southern West Virginia)	**505,675**	**0.537**	**306,684**	**0.571**	**14.6**	**76,841**	**0.526**	**10.4**	**122,150**	**0.465**	**7.8**	**25.0**
District 5 (Virginia)	**319,938**	**0.459**	**189,744**	**0.464**	**9.3**	**54,490**	**0.505**	**8.1**	**75,704**	**0.415**	**4.8**	**18.8**
District 6 (Eastern Kentucky)	**317,849**	**0.408**	**154,077**	**0.392**	**7.0**	**57,013**	**0.464**	**8.1**	**106,759**	**0.403**	**5.4**	**19.5**
District 7	**296,787**	**0.440**	**143,673**	**0.443**	**7.2**	**61,850**	**0.474**	**6.6**	**91,264**	**0.415**	**5.2**	**20.1**
Northern Georgia	29	0.328	29	0.328	0	0	-	-	0	-	-	-
Central Kentucky	247,707	0.449	111,869	0.452	7.4	53,154	0.483	6.7	82,684	0.425	5.3	20.4
North Carolina	9	0.147	6	0.159	0	3	0.126	0	0	-	-	-
South Carolina	0	-	0	-	-	0	-	-	0	-	-	-
Tennessee	49,037	0.399	31,769	0.413	6.4	8,693	0.425	5.6	8,575	0.328	4.9	16.8
District 8	**163,445**	**0.758**	**99,896**	**0.681**	**14.6**	**25,965**	**0.898**	**14.1**	**37,584**	**0.894**	**14.7**	**49.5**
Illinois	143,956	0.805	90,824	0.730	15.6	23,314	0.973	14.8	29,818	0.933	14.0	50.5
Indiana	17,794	0.506	7,566	0.342	5.2	2,496	0.455	8.3	7,732	0.768	17.4	45.8
Iowa	886	0.384	813	0.388	5.3	73	0.344	0	0	-	-	-
Michigan	0	-	0	-	-	0	-	-	0	-	-	-
Minnesota	0	-	0	-	-	0	-	-	0	-	-	-
Northern Missouri	809	0.248	693	0.259	1.7	82	0.240	2.4	34	0.107	0	0
Wisconsin	0	-	0	-	-	0	-	-	0	-	-	-

See footnotes at end of table.

Table 2-16 (page 2 of 3). Respirable coal mine dust: Geometric mean exposures and percent exceeding designated occupational exposure limits by MSHA coal mine district and state, MSHA inspector and mine operator samples, 1979–2003

MSHA Coal Mine District	All years		1979–1989			1990–1994			1995–2003			
	No. of Samples	GM (mg/m^3)	No. of Samples	GM (mg/m^3)	% > PEL	No. of Samples	GM (mg/m^3)	% > PEL	No. of Samples	GM (mg/m^3)	% > PEL	% > REL
District 9	**135,558**	**0.658**	**78,638**	**0.696**	**19.7**	**21,908**	**0.756**	**14.9**	**35,012**	**0.532**	**7.4**	**30.3**
Alaska	267	0.303	181	0.408	6.6	48	0.237	2.1	38	0.099	-	2.9
Arizona	1,025	0.219	484	0.310	5.0	198	0.302	4.5	343	0.112	1.2	1.2
Arkansas	442	0.177	238	0.205	2.5	37	0.149	2.7	167	0.149	1.2	6.0
California	12	0.218	0	-	-	1	0.400	-	11	0.206	-	9.1
Colorado	42,900	0.833	25,704	0.846	24.1	6,577	0.913	16.3	10,619	0.758	8.3	37.7
Hawaii	0	-	0	-	-	0	-	-	0	-	-	-
Idaho	0	-	0	-	-	0	-	-	0	-	-	-
Kansas	555	0.207	381	0.236	2.6	49	0.190	0	125	0.142	0.8	0.8
Louisiana	178	0.193	14	0.163	-	39	0.228	0	125	0.186	-	4.3
Southern Missouri	742	0.230	452	0.254	1.8	56	0.160	0	234	0.209	1.3	7.6
Montana	2,015	0.269	1,095	0.367	7.2	211	0.248	2.8	709	0.170	2.4	4.9
Nebraska	0	-	0	-	-	0	-	-	0	-	-	-
Nevada	0	-	0	-	-	0	-	-	0	-	-	-
New Mexico	6,231	0.541	3,531	0.769	23.8	870	0.749	20.1	1,830	0.235	2.8	8.7
North Dakota	1,515	0.166	1,028	0.220	1.9	162	0.154	0.6	325	0.070	0.3	0.9
Oklahoma	5,329	0.331	2,949	0.342	6.7	973	0.322	6.6	1,407	0.313	3.0	11.3
Oregon	0	-	0	-	-	0	-	-	0	-	-	-
Texas	4,560	0.161	2,738	0.194	1.4	664	0.198	3.9	1,158	0.092	0.8	2.5
Utah	58,873	0.835	33,984	0.834	21.7	10,212	0.925	16.3	14,677	0.781	9.5	38.7
Washington	394	0.157	124	0.166	0	74	0.257	2.7	196	0.127	0.5	3.1
Wyoming	10,520	0.418	5,735	0.479	12.4	1,737	0.567	14.1	3,048	0.272	5.7	16.9

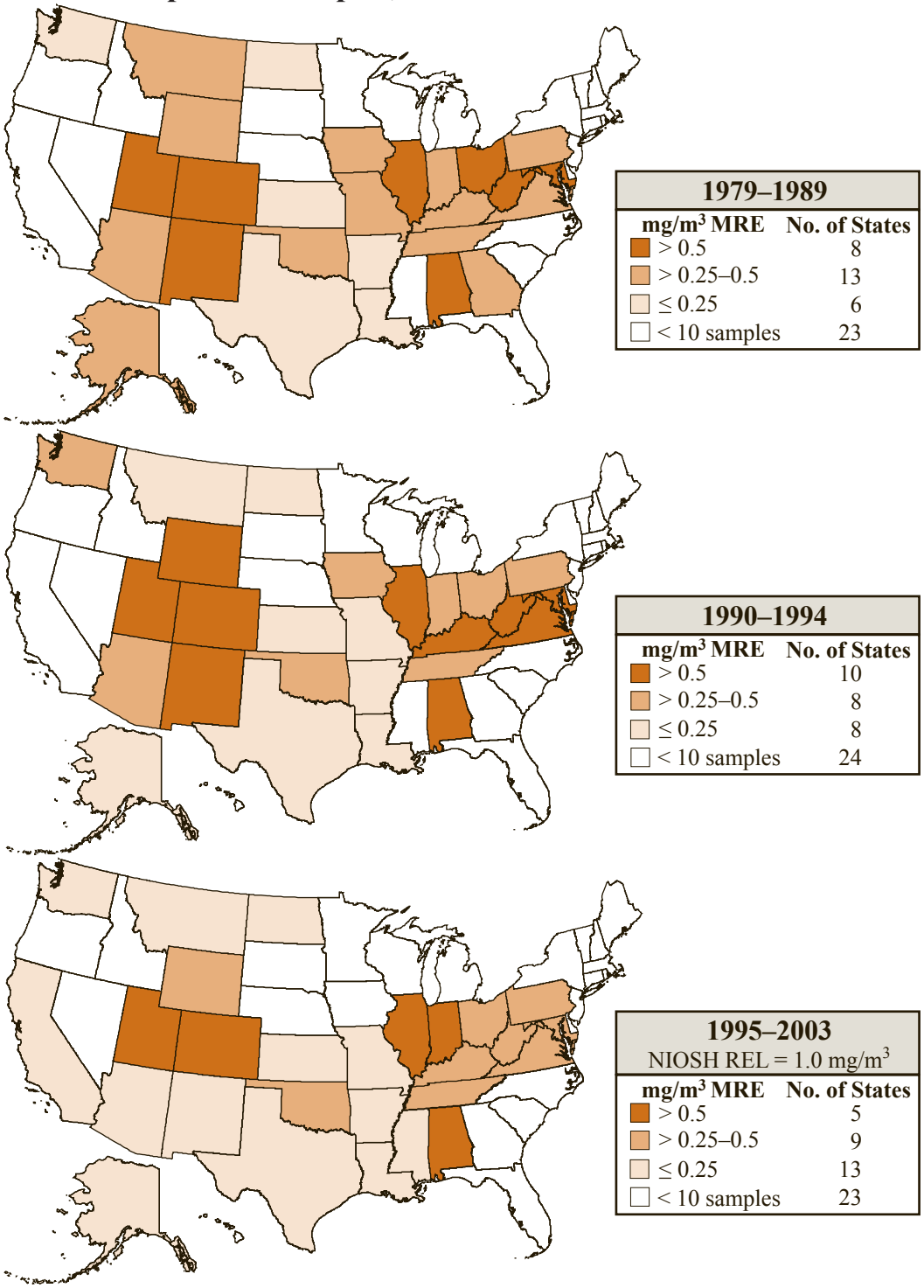
See footnotes at end of table.

Table 2-16 (page 3 of 3). Respirable coal mine dust: Geometric mean exposures and percent exceeding designated occupational exposure limits by MSHA coal mine district and state, MSHA inspector and mine operator samples, 1979–2003

	All years		1979–1989			1990–1994			1995–2003			
MSHA Coal Mine District	**No. of Samples**	**GM (mg/m^3)**	**No. of Samples**	**GM (mg/m^3)**	**% > PEL**	**No. of Samples**	**GM (mg/m^3)**	**% > PEL**	**No. of Samples**	**GM (mg/m^3)**	**% > PEL**	**% > REL**
District 10 (Western Kentucky)	**86,886**	**0.693**	**50,904**	**0.603**	**12.1**	**14,234**	**0.847**	**14.8**	**21,748**	**0.839**	**12.0**	**48.3**
District 11	**97,389**	**0.658**	**52,546**	**0.714**	**15.7**	**18,069**	**0.719**	**10.4**	**26,774**	**0.528**	**6.1**	**28.0**
Alabama	97,340	0.659	52,546	0.714	15.7	18,069	0.719	10.4	26,725	0.531	6.1	28.0
Florida	0	-	0	-	-	0	-	-	0	-	-	-
Central and Southern Georgia	0	-	0	-	-	0	-	-	0	-	-	-
Mississippi	46	0.040	0	-	-	0	-	-	46	0.040	0	0
Puerto Rico	0	-	0	-	-	0	-	-	0	-	-	-
Virgin Islands	0	-	0	-	-	0	-	-	0	-	-	-
TOTAL	**2,565,365**	**0.510**	**1,490,992**	**0.526**	**11.6**	**416,954**	**0.541**	**9.3**	**657,419**	**0.458**	**6.5**	**24.6**

- indicates incalculable field. PEL - permissible exposure limit REL - recommended exposure limit GM - geometric mean mg/m^3 - 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^3 MRE; for respirable dust containing greater than 5% quartz, the MSHA PEL is [(10 mg/m^3 MRE) / (% quartz)]. The NIOSH REL of 1 mg/m^3 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 for respirable coal mine dust containing less than or equal to 5% quartz, regardless of actual quartz content. See appendices for source description and methods.
SOURCE: MSHA coal mine inspector and mine operator dust data.

Figure 2-7. Respirable coal mine dust: Geometric mean exposures by state, MSHA inspector and mine operator samples, 1979–2003



REL - recommended exposure limit mg/m^3 - milligrams per cubic meter MRE - Mining Research Establishment
MSHA - Mine Safety and Health Administration
NOTE: The NIOSH REL of 1 mg/m^3 MRE for respirable coal mine dust was adopted in September of 1995. Geometric means are reported in MRE equivalent. See appendices for source description, methods, and agents.
SOURCE: MSHA coal mine inspector and mine operator dust data.