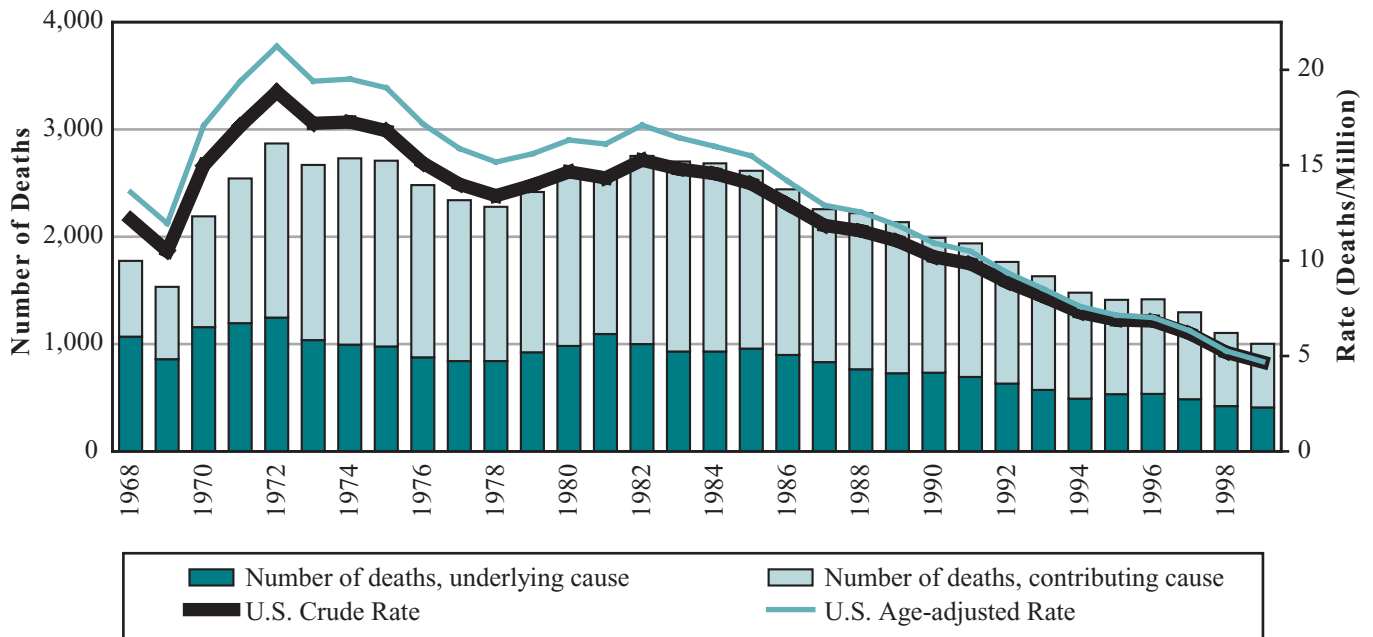

Section 2

Coal Workers' Pneumoconiosis and Related Exposures

Coal Workers' Pneumoconiosis: Mortality

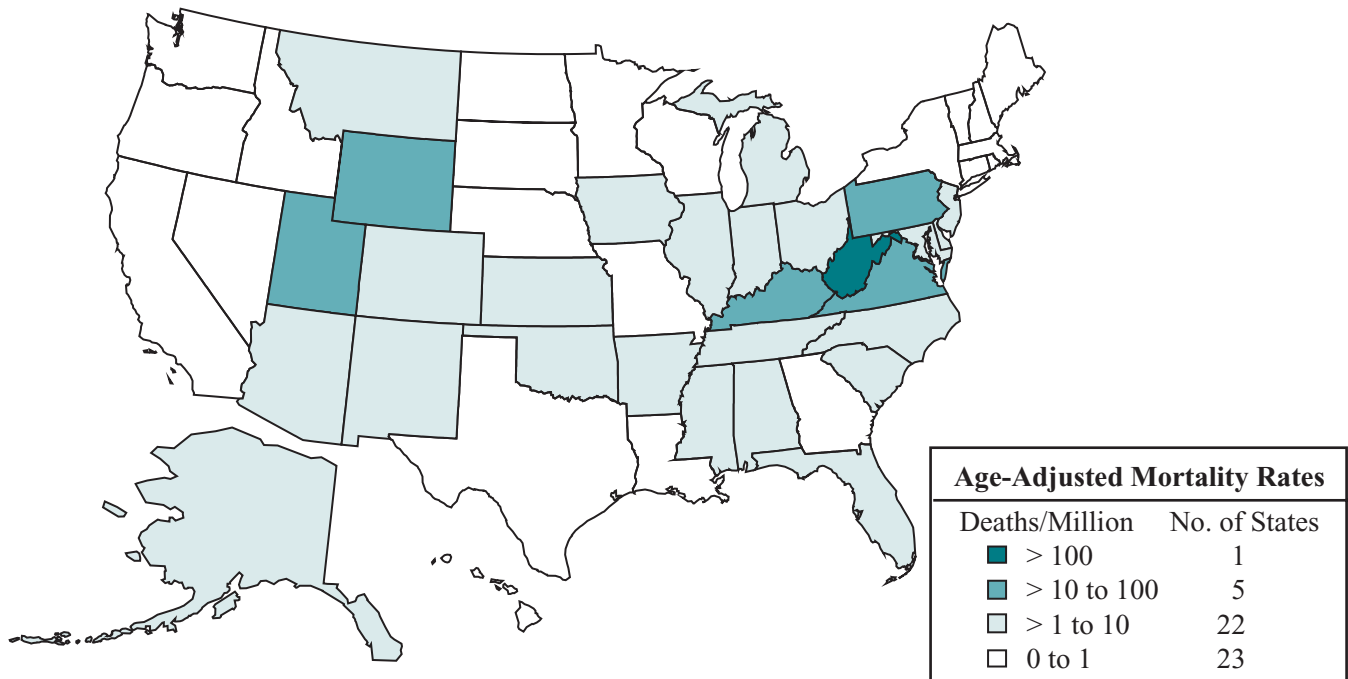
Figure 2-1. Coal workers' pneumoconiosis: Number of deaths, crude and age-adjusted mortality rates, U.S. residents age 15 and over, 1968-1999



NOTE: 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. Bureau of the Census.

Figure 2-2. Coal workers' pneumoconiosis: Age-adjusted mortality rates by state, U.S. residents age 15 and over, 1990-1999



NOTE: 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. Bureau of the Census.

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, 1990-1999

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+	
1990	1,990	36.9	1,975	15	1,912	72	6	-	-	6	30	120	607	893	334	77.0
1991	1,938	35.8	1,920	18	1,877	60	1	1	2	14	23	110	536	884	368	77.0
1992	1,766	35.7	1,761	5	1,707	55	4	-	2	6	14	90	457	858	339	78.0
1993	1,631	35.1	1,616	15	1,567	62	2	-	2	4	24	111	404	777	309	78.0
1994	1,478	33.3	1,465	13	1,434	42	2	-	-	6	15	78	345	741	293	79.0
1995	1,413	37.7	1,407	6	1,372	41	-	-	3	4	28	75	354	614	335	79.0
1996	1,417	37.8	1,407	10	1,375	39	3	-	-	4	22	51	327	673	340	79.0
1997	1,297	37.5	1,283	14	1,267	30	-	-	2	7	24	54	266	623	321	80.0
1998	1,103	38.2	1,093	10	1,066	35	2	-	1	4	15	51	235	503	294	80.0
1999	1,003	40.9	998	5	971	31	1	-	1	3	10	52	174	459	304	81.0
TOTAL	15,036	36.6	14,925	111	14,548	467	21	1	13	58	205	792	3,705	7,025	3,237	78.0

- indicates no deaths listed.

NOTE: See appendices for source description, methods, and ICD codes.

SOURCE: National Center for Health Statistics multiple cause of death data.

Coal Workers' Pneumoconiosis: Mortality

Table 2-2. Coal workers' pneumoconiosis: Mortality rates (per million population) by race and sex, U.S. residents age 15 and over, 1990-1999

Year	Overall	White		Black		Other	
		Male	Female	Male	Female	Male	Female
Crude Mortality Rate							
1990	10.19	23.70	0.14	6.82	0.17	1.44	0.27
1991	9.84	23.03	0.21	5.76	–	0.28	–
1992	8.87	20.89	0.06	5.19	–	1.06	–
1993	8.11	18.90	0.17	5.75	–	0.52	–
1994	7.28	17.16	0.15	3.83	–	0.50	–
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	–
1990-1999	7.33	17.29	0.11	4.13	0.05	0.44	0.07
Age-Adjusted Mortality Rate							
1990	10.91	31.16	0.12	14.22	0.21	3.68	0.66
1991	10.48	30.29	0.19	12.48	–	0.39	–
1992	9.38	27.29	0.05	10.84	–	2.69	–
1993	8.51	24.18	0.14	11.78	–	0.67	–
1994	7.60	21.82	0.12	8.58	–	1.08	–
1995	7.14	20.72	0.05	7.87	–	–	–
1996	7.02	20.30	0.09	7.25	–	1.30	0.42
1997	6.32	18.82	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	–
1990-1999	7.59	21.75	0.10	8.72	0.06	1.04	0.16

– indicates no deaths listed.

NOTE: 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. Bureau of the Census.

Coal Workers' Pneumoconiosis: Mortality

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, 1990-1999

Year	White		Black		Other		Total
	Male	Female	Male	Female	Male	Female	
Years of Potential Life Lost to Age 65							
1990	1,145	–	25	5	25	–	1,200
1991	1,205	115	35	–	5	–	1,360
1992	810	20	50	–	–	–	880
1993	990	5	65	–	25	–	1,085
1994	745	5	15	–	–	–	765
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
TOTAL	8,310	285	330	5	55	–	8,985
Years of Potential Life Lost to Life Expectancy							
1990	17,883	126	548	29	75	8	18,669
1991	17,780	336	472	–	21	–	18,609
1992	15,428	89	463	–	43	–	16,023
1993	14,298	157	540	–	52	–	15,047
1994	12,828	137	306	–	22	–	13,293
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
TOTAL	132,370	1,456	3,745	68	246	22	137,907

– indicates no deaths listed.

NOTE: See appendices for source description, methods, and ICD codes.

SOURCE: National Center for Health Statistics multiple cause of death data.

Coal Workers' Pneumoconiosis: Mortality

Table 2-4. Coal workers' pneumoconiosis: Number of deaths by state, U.S. residents age 15 and over, 1990-1999

State	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
Alabama	29	28	23	19	21	15	14	15	13	8	185
Alaska	-	-	1	-	1	-	-	-	-	1	3
Arizona	5	4	2	4	6	6	7	2	1	4	41
Arkansas	9	7	6	7	3	3	5	4	3	7	54
California	28	41	22	27	28	13	12	4	17	8	200
Colorado	15	15	19	18	6	10	7	11	8	9	118
Connecticut	2	1	3	1	7	1	-	-	1	1	17
Delaware	4	4	1	2	3	-	-	2	-	-	16
District of Columbia	-	-	-	-	-	1	-	-	-	-	1
Florida	25	33	23	25	15	21	28	23	14	16	223
Georgia	4	3	2	7	3	5	3	3	1	2	33
Hawaii	-	-	-	-	-	-	-	-	-	-	-
Idaho	-	-	1	1	-	-	1	2	2	1	8
Illinois	49	43	46	30	24	36	41	39	26	24	358
Indiana	19	33	19	15	16	19	16	22	22	12	193
Iowa	6	6	6	7	1	4	7	4	3	4	48
Kansas	2	2	2	4	3	6	4	1	2	1	27
Kentucky	115	112	116	114	81	84	129	99	90	90	1,030
Louisiana	1	3	-	2	2	1	2	2	1	1	15
Maine	-	-	-	1	-	-	-	-	11	-	12
Maryland	12	5	13	6	10	7	8	7	-	7	75
Massachusetts	2	2	2	-	-	-	-	-	1	-	7
Michigan	21	15	10	11	11	6	10	9	7	6	106
Minnesota	-	-	-	-	-	-	-	-	-	-	-
Mississippi	2	3	1	1	2	6	1	7	6	6	35
Missouri	4	6	11	7	5	3	1	2	2	3	44
Montana	-	-	-	-	1	3	2	2	-	-	8
Nebraska	-	-	-	-	-	-	-	1	1	-	2
Nevada	1	1	1	1	1	-	1	-	-	1	7
New Hampshire	-	-	-	1	-	-	-	1	-	-	2
New Jersey	11	8	14	7	3	8	8	4	5	4	72
New Mexico	3	3	4	4	4	5	7	5	5	4	44
New York	9	4	2	9	11	1	4	4	2	6	52
North Carolina	12	13	10	7	8	15	9	4	6	9	93
North Dakota	1	-	-	-	1	-	-	1	-	-	3
Ohio	79	83	74	64	57	71	64	41	52	31	616
Oklahoma	5	4	1	4	3	4	1	5	2	2	31
Oregon	1	1	1	2	-	1	1	1	1	1	10
Pennsylvania	1,030	961	836	730	681	592	622	550	464	409	6,875
Rhode Island	-	-	-	1	-	-	1	-	-	-	2
South Carolina	1	-	5	3	5	4	3	1	5	2	29
South Dakota	-	-	-	-	-	-	-	1	-	-	1
Tennessee	37	23	30	25	28	30	25	19	23	26	266
Texas	5	7	9	4	6	2	8	6	2	7	56
Utah	18	12	13	12	16	13	6	8	9	5	112
Vermont	-	1	-	-	-	1	-	129	-	-	131
Virginia	131	134	147	151	100	118	124	-	82	86	1,073
Washington	6	1	1	6	4	3	5	6	4	-	36
West Virginia	279	308	283	287	289	291	228	245	207	196	2,613
Wisconsin	3	1	-	1	1	1	-	3	1	1	12
Wyoming	4	7	6	3	11	3	2	2	1	2	41
TOTAL	1,990	1,938	1,766	1,631	1,478	1,413	1,417	1,297	1,103	1,003	15,036

- indicates no deaths listed.

NOTE: See appendices for source description, methods, and ICD codes.

SOURCE: National Center for Health Statistics multiple cause of death data.

Coal Workers' Pneumoconiosis: Mortality

Table 2-5. Coal workers' pneumoconiosis: Number of deaths, mortality rates (per million population), and years of potential life lost (YPLL) by state, U.S. residents age 15 and over, 1990-1999

State	No. of Deaths		Crude Mortality		Age-Adjusted Mortality		YPLL to Life Expectancy			
	Rate	Rank	Rate	Rank	Rate	Rank	Total	Rank	YPLL/death	Rank
Alabama	185	11	5.58	9	5.75	9	1,756	11	9.5	31
Alaska	3	41	0.69	32	2.59	16	23	42	7.7	44
Arizona	41	24	1.26	23	1.35	23	363	26	8.9	34
Arkansas	54	19	2.79	15	2.39	17	487	21	9.0	32
California	200	9	0.82	31	0.97	30	3,063	7	15.3	5
Colorado	118	12	4.07	11	5.34	10	1,009	14	8.5	38
Connecticut	17	32	0.65	33	0.63	35	142	33	8.3	41
Delaware	16	33	2.83	14	3.25	14	142	33	8.9	34
District of Columbia	1	47	0.22	44	0.24	44	8	48	8.3	41
Florida	223	8	1.94	18	1.50	22	2,312	9	10.4	18
Georgia	33	28	0.59	35	0.76	34	357	27	10.8	16
Hawaii	-	-	-	-	-	-	-	-	-	-
Idaho	8	37	0.93	29	1.00	29	99	37	12.3	9
Illinois	358	6	3.89	12	4.01	13	3,711	6	10.4	18
Indiana	193	10	4.28	10	4.33	11	1,931	10	10.0	24
Iowa	48	21	2.17	16	1.68	20	405	24	8.4	39
Kansas	27	31	1.37	22	1.29	24	418	23	15.5	4
Kentucky	1,030	4	34.13	3	34.39	3	11,919	4	11.6	12
Louisiana	15	34	0.46	37	0.53	36	263	32	17.6	3
Maine	1	47	0.10	49	0.10	49	8	48	8.3	41
Maryland	86	16	2.16	17	2.79	15	842	17	9.8	25
Massachusetts	7	39	0.14	48	0.14	47	95	38	13.5	6
Michigan	106	14	1.43	21	1.56	21	1,131	12	10.7	17
Minnesota	-	-	-	-	-	-	-	-	-	-
Mississippi	35	27	1.72	19	1.80	19	914	16	26.1	2
Missouri	44	22	1.06	27	0.95	31	459	22	10.4	18
Montana	8	37	1.20	25	1.17	26	58	40	7.3	47
Nebraska	2	43	0.16	47	0.13	48	15	45	7.4	46
Nevada	7	39	0.58	36	0.82	33	68	39	9.7	27
New Hampshire	2	43	0.22	44	0.25	43	17	44	8.4	39
New Jersey	72	17	1.13	26	1.19	25	702	18	9.8	25
New Mexico	44	22	3.49	13	4.23	12	384	25	8.7	36
New York	52	20	0.36	41	0.37	40	537	20	10.3	21
North Carolina	93	15	1.62	20	1.83	18	951	15	10.2	22
North Dakota	3	41	0.61	34	0.50	37	23	42	7.6	45
Ohio	616	5	7.08	7	7.13	7	5,968	5	9.7	27
Oklahoma	31	29	1.22	24	1.16	27	355	28	11.5	13
Oregon	10	36	0.41	39	0.37	40	135	36	13.5	6
Pennsylvania	6,875	1	71.22	2	62.73	2	66,262	1	9.6	29
Rhode Island	2	43	0.25	43	0.23	45	14	47	7.2	49
South Carolina	29	30	1.02	28	1.14	28	341	30	11.8	10
South Dakota	1	47	0.18	46	0.19	46	39	41	38.7	1
Tennessee	266	7	6.41	8	6.65	8	2,677	8	10.1	23
Texas	56	18	0.40	40	0.49	38	693	19	12.4	8
Utah	112	13	8.37	6	10.74	6	1,073	13	9.6	29
Vermont	2	43	0.44	38	0.46	39	15	45	7.3	47
Virginia	1,202	3	22.96	4	28.26	4	14,223	3	11.8	10
Washington	36	26	0.86	30	0.94	32	323	31	9.0	32
West Virginia	2,613	2	179.64	1	157.33	1	29,547	2	11.3	14
Wisconsin	12	35	0.30	42	0.29	42	136	35	11.3	14
Wyoming	41	24	11.45	5	13.91	5	351	29	8.6	37

- indicates no deaths listed.

NOTE: 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. Bureau of the Census.

Coal Workers' Pneumoconiosis: Mortality

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

n.e.c. - not elsewhere classified

NOTE: Percentages may not total to 100% due to rounding. See appendices for source description, methods, and 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	62	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	655	13.4
	Occupation not reported	199	4.1
	TOTAL	4,893	100.0

COC - Census Occupation Code

n.e.c. - not elsewhere classified

NOTE: Percentages may not total to 100% due to rounding. See appendices for source description, methods, and ICD codes, industry and occupation codes, and list of selected states and years.

SOURCE: National Center for Health Statistics multiple cause of death data.

Coal Workers' Pneumoconiosis: Mortality

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	53.18	51.50	54.91
040	Metal mining	25	1.98	1.28	2.92

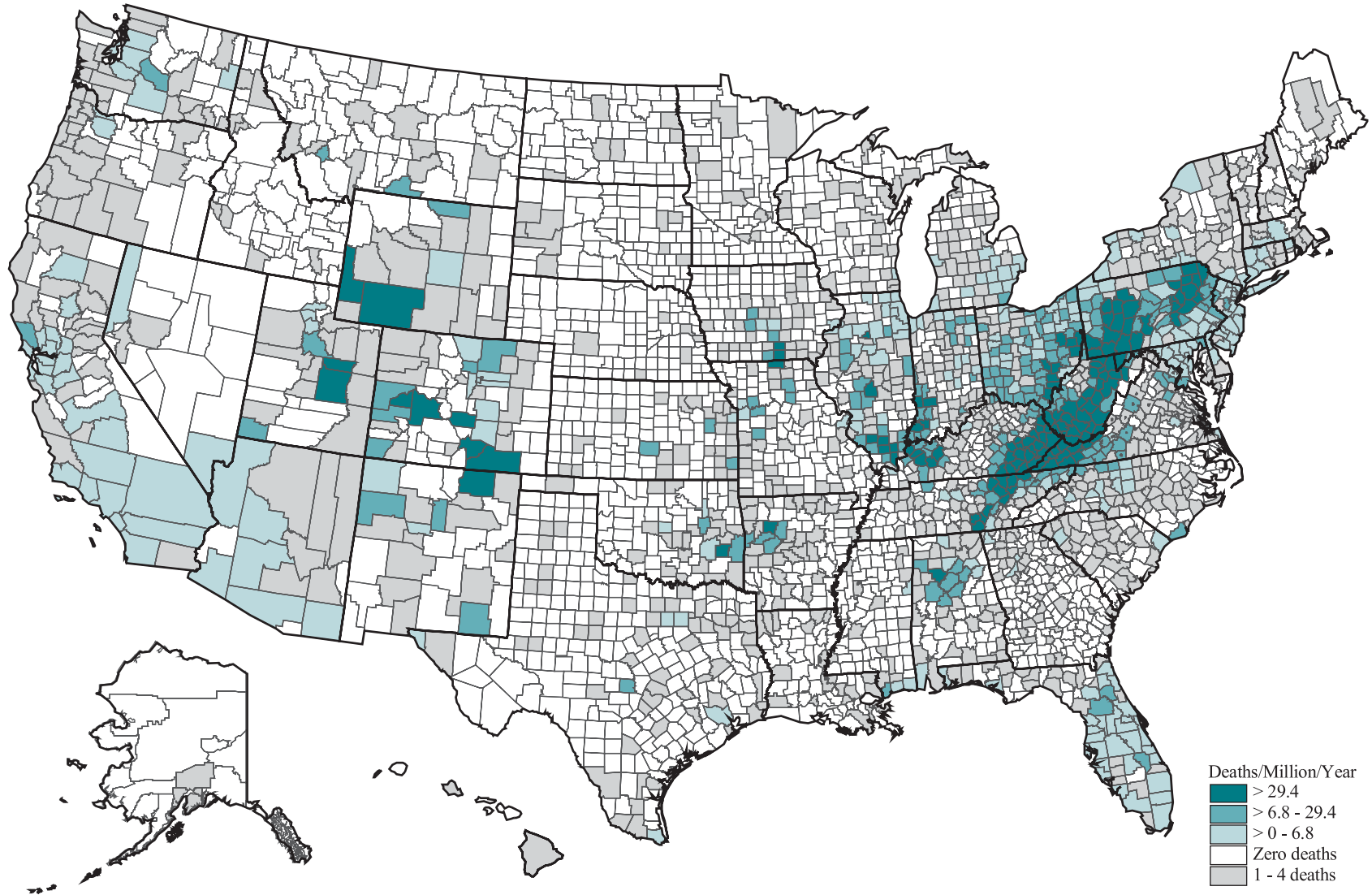
CIC - Census Industry Code n.e.c. - not elsewhere classified LCL - lower confidence limit UCL - upper confidence limit
 NOTE: See appendices for source description, methods, and ICD codes, industry and occupation codes, and list of selected states and years.
 SOURCE: National Center for Health Statistics 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	51.67	49.97	53.44
613	Supervisors, extractive occupations	49	14.36	10.64	18.99
046	Mining engineers	8	6.03	2.60	11.86
617	Mining occupations, n.e.c.	14	4.45	2.43	7.46
859	Miscellaneous material moving equipment operators	12	2.27	1.17	3.96
824	Locomotive operating occupations	23	2.03	1.29	3.05

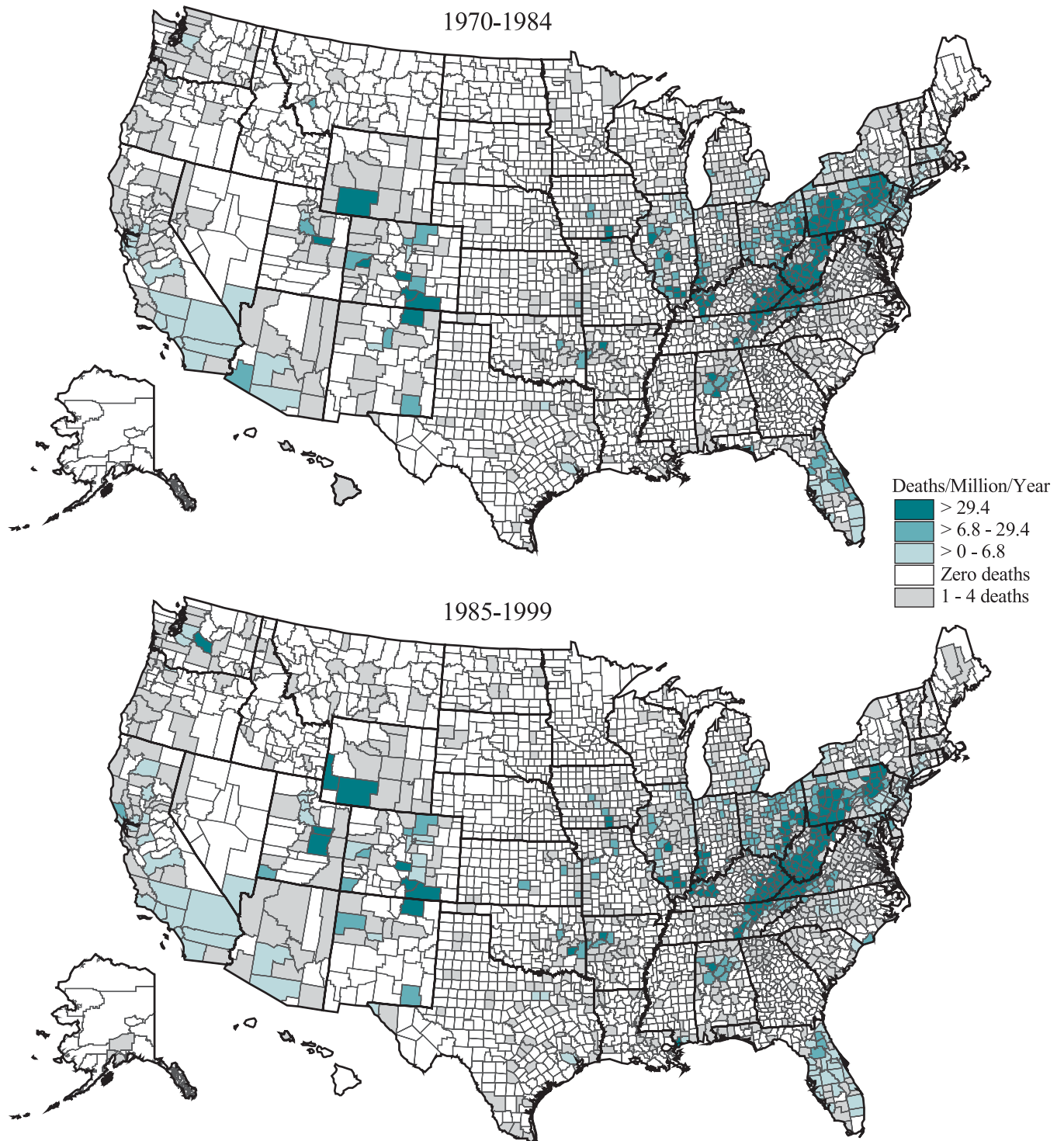
COC - Census Occupation Code n.e.c. - not elsewhere classified LCL - lower confidence limit UCL - upper confidence limit
 NOTE: See appendices for source description, methods, and ICD codes, industry and occupation codes, and list of selected states and years.
 SOURCE: National Center for Health Statistics multiple cause of death data.

36 **Figure 2-3. Coal workers' pneumoconiosis: Age-adjusted mortality rates by county, U.S. residents age 15 and over, 1970-1999**



NOTE: Age-adjusted rates are not calculated for those counties with 1-4 deaths. 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. Bureau of the Census.

Figure 2-4. Coal workers' pneumoconiosis: Age-adjusted mortality rates by county, U.S. residents age 15 and over, 1970-1984 and 1985-1999



NOTE: Age-adjusted rates are not calculated for those counties with 1-4 deaths. 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. Bureau of the Census.

Coal Workers' Pneumoconiosis: Mortality

Table 2-10. Coal workers' pneumoconiosis: Counties with highest age-adjusted mortality rates (per million population), U.S. residents age 15 and over, 1985-1999

County	State	Age-Adjusted Rate	Crude Rate	Number of Deaths	% Female
Buchanan County	Virginia	1,659.8	1,170.4	430	0.2
Schuylkill County	Pennsylvania	1,042.4	1,454.2	2,744	0.1
McDowell County	West Virginia	1,019.1	1,141.7	447	0.0
Raleigh County	West Virginia	999.2	1,134.7	1,035	0.0
Wyoming County	West Virginia	922.0	769.3	258	0.0
Floyd County	Kentucky	890.2	799.2	401	0.0
Tazewell County	Virginia	741.0	763.6	426	0.2
Wise County	Virginia	739.4	746.4	349	0.3
Dickenson County	Virginia	716.8	703.8	146	0.7
Norton City	Virginia	660.8	655.7	33	0.0
Luzerne County	Pennsylvania	652.4	916.8	3,718	0.3
Boone County	West Virginia	581.3	557.2	173	0.0
Fayette County	West Virginia	536.8	677.8	388	0.0
Letcher County	Kentucky	524.8	492.4	152	0.7
Logan County	West Virginia	514.9	495.4	247	0.4
Harlan County	Kentucky	477.8	471.6	196	0.0
Russell County	Virginia	468.3	442.0	152	0.0
Northumberland County	Pennsylvania	458.2	640.6	744	0.1
Carbon County	Utah	408.8	449.4	97	0.0
Cambria County	Pennsylvania	388.3	512.4	1,008	0.1
Knott County	Kentucky	370.5	299.6	62	0.0
Somerset County	Pennsylvania	360.0	444.3	415	0.0
Lee County	Virginia	352.6	413.3	119	0.8
Mingo County	West Virginia	350.5	290.5	109	0.0
Webster County	West Virginia	341.7	409.2	50	0.0
Carbon County	Pennsylvania	332.6	437.4	308	0.3
Bell County	Kentucky	323.9	320.0	115	0.0
Lackawanna County	Pennsylvania	313.8	439.7	1,173	0.3
Fayette County	Pennsylvania	307.1	391.7	686	0.0
Nicholas County	West Virginia	300.2	322.6	101	1.0
Mercer County	West Virginia	288.3	353.4	277	0.4
Johnson County	Kentucky	287.1	240.9	66	0.0
Emery County	Utah	284.9	226.5	22	0.0
Pike County	Kentucky	253.1	209.2	177	0.6
Greene County	Pennsylvania	244.2	306.8	144	0.0
Franklin County	Illinois	241.0	347.9	168	0.0
Muhlenberg County	Kentucky	213.3	241.4	89	0.0
Knox County	Kentucky	203.6	206.8	72	1.4
Leslie County	Kentucky	201.0	162.6	25	0.0
Campbell County	Tennessee	198.1	213.1	90	0.0
Indiana County	Pennsylvania	194.2	196.6	214	0.0
Martin County	Kentucky	193.8	149.2	21	0.0
Perry County	Kentucky	187.1	157.9	56	0.0
Greenbrier County	West Virginia	184.9	237.4	101	0.0
Clay County	West Virginia	180.9	194.9	22	0.0
Preston County	West Virginia	176.3	196.2	67	0.0
Marion County	West Virginia	155.9	207.6	146	0.0
Whitley County	Kentucky	155.4	156.8	62	0.0
Grundy County	Tennessee	142.8	154.1	24	0.0
Sweetwater County	Wyoming	137.2	79.0	34	0.0
Overall United States		9.4	8.9	26,706	0.7

NOTE: Only counties with at least 5 deaths from the disease of interest are included. 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. Bureau of the Census.

Table 2-11. Coal workers' pneumoconiosis: Estimated number of discharges from short-stay nonfederal hospitals, 1970-2000

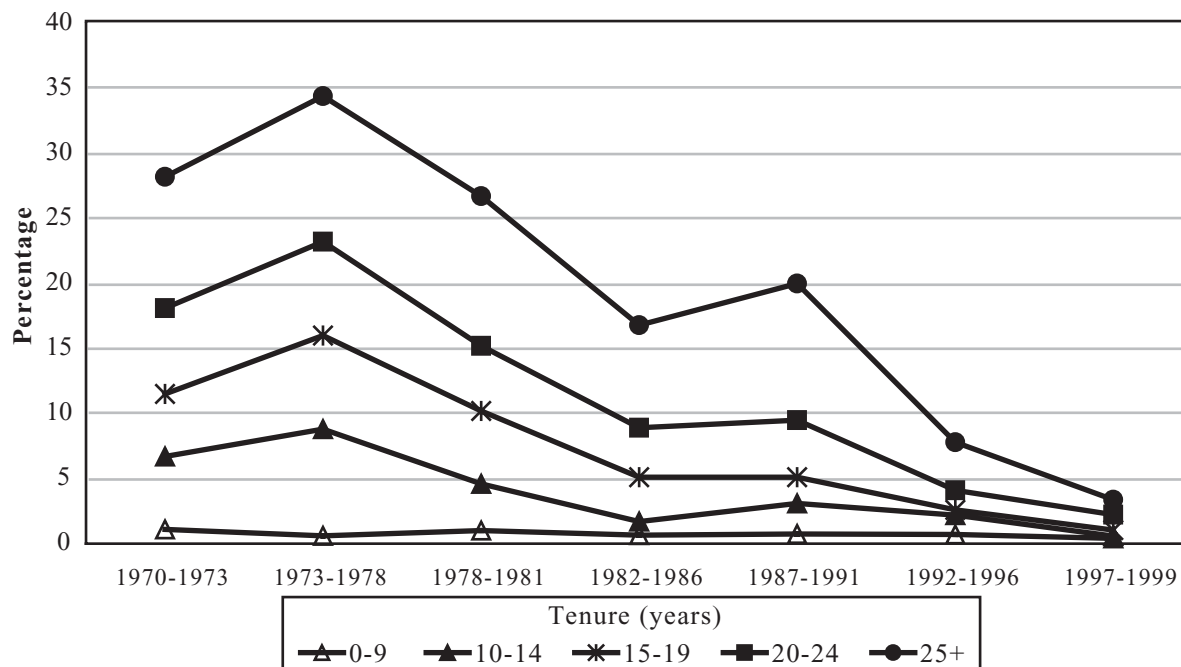
Year	Number of Discharges
1970	6,000
1971	8,000
1972	11,000
1973	13,000
1974	14,000
1975	17,000
1976	18,000
1977	18,000
1978	13,000
1979	18,000
1980	17,000
1981	14,000
1982	17,000
1983	22,000
1984	23,000
1985	18,000
1986	16,000
1987	17,000
1988	15,000
1989	11,000
1990	7,000
1991	11,000
1992	10,000
1993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

NOTE: Number of discharges has been rounded. NCHS 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.

Coal Workers' Pneumoconiosis: Morbidity

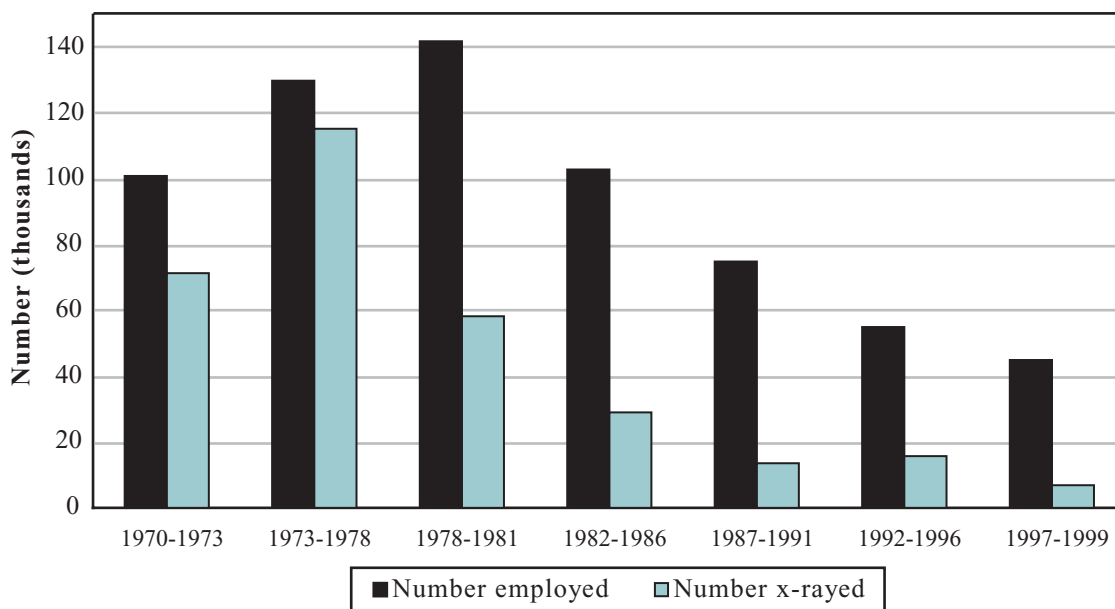
Figure 2-5. CWXSP: Percentage of examined miners with coal workers' pneumoconiosis (category 1/0+) by tenure in mining, 1970-1999



NOTE: 1997-1999 represents a partial round. See appendices for source description.

SOURCE: NIOSH Coal Workers' X-ray Surveillance Program.

Figure 2-6. CWXSP: Estimated number of actively employed underground coal miners and number examined, 1970-1999



NOTE: 1997-1999 represents a partial round. See appendices for source description.

SOURCE: NIOSH Coal Workers' X-ray Surveillance Program. Mine Safety and Health Administration (MSHA) coal mine employment data

Table 2-12. CWXSP: Number and percentage of examined miners with coal workers' pneumoconiosis (category 1/0+), by round and tenure, 1970-1999

Tenure Years in Mining	Round 1 1970-1973			Round 2 1973-1978			Round 3 1978-1981			Round 4 1982-1986			Round 5 1987-1991			Round 6 1992-1996			Round 7 1997-1999		
	Miners examined No.	Cat. 1/0+ No.	%	Miners examined No.	Cat. 1/0+ No.	%	Miners examined No.	Cat. 1/0+ No.	%	Miners examined No.	Cat. 1/0+ No.	%	Miners examined No.	Cat. 1/0+ No.	%	Miners examined No.	Cat. 1/0+ No.	%	Miners examined No.	Cat. 1/0+ No.	%
0	15,844	100	0.6	50,341	31	0.1	14,528	94	0.6	3,577	18	0.5	2,007	10	0.5	1,812	13	0.7	969	6	0.6
1	5,287	49	0.9	9,579	13	0.1	3,719	18	0.5	742	1	0.1	356	0	0.0	238	2	0.8	163	0	0.0
2-4	8,274	73	0.9	18,432	137	0.7	12,059	103	0.8	3,786	25	0.7	1,057	6	0.6	791	2	0.3	388	2	0.5
5-9	6,706	182	2.7	13,528	386	2.8	14,157	215	1.5	7,434	57	0.8	2,763	30	1.1	1,235	12	1.0	418	0	0.0
10-14	4,451	298	6.7	5,282	466	8.8	5,318	246	4.6	5,435	93	1.7	4,120	123	3.0	2,522	56	2.2	511	3	0.6
15-19	4,743	546	11.5	3,380	542	16.0	2,168	221	10.2	1,824	93	5.1	2,279	114	5.0	4,646	119	2.6	1,148	12	1.0
20-24	7,279	1,316	18.1	3,214	745	23.2	1,505	228	15.2	711	63	8.9	769	71	9.2	3,220	132	4.1	1,983	44	2.2
25-29	6,260	1,368	21.8	4,437	1,279	28.8	1,294	257	19.9	491	64	13.0	257	52	20.2	938	51	5.4	1,057	28	2.7
30+	12,602	3,947	31.3	7,193	2,722	37.8	3,546	1,034	29.2	1,154	213	18.5	312	61	19.6	365	51	14.0	277	17	6.1
TOTAL	71,446	7,897	11.0	115,386	6,321	5.5	58,294	2,416	4.1	25,154	627	2.5	13,920	467	3.4	15,767	438	2.8	6,914	112	1.6

NOTE: Tabulations are based on one chest x-ray per round for each participating miner.

Round 1: Jan. 1970 - July 1973

Round 2: Aug. 1973 - July 1978

Round 3: Aug. 1978 - Dec. 1981

Round 4: Jan. 1982 - Dec. 1986

Round 5: Jan. 1987 - Dec. 1991

Round 6: Jan. 1992 - Dec. 1996

Round 7: Jan. 1997 - Dec. 1999

NOTE: 1997-1999 represents a partial round. See appendices for source description.

SOURCE: NIOSH Coal Workers' X-ray Surveillance Program.

Coal Workers' Pneumoconiosis: Black Lung Benefits

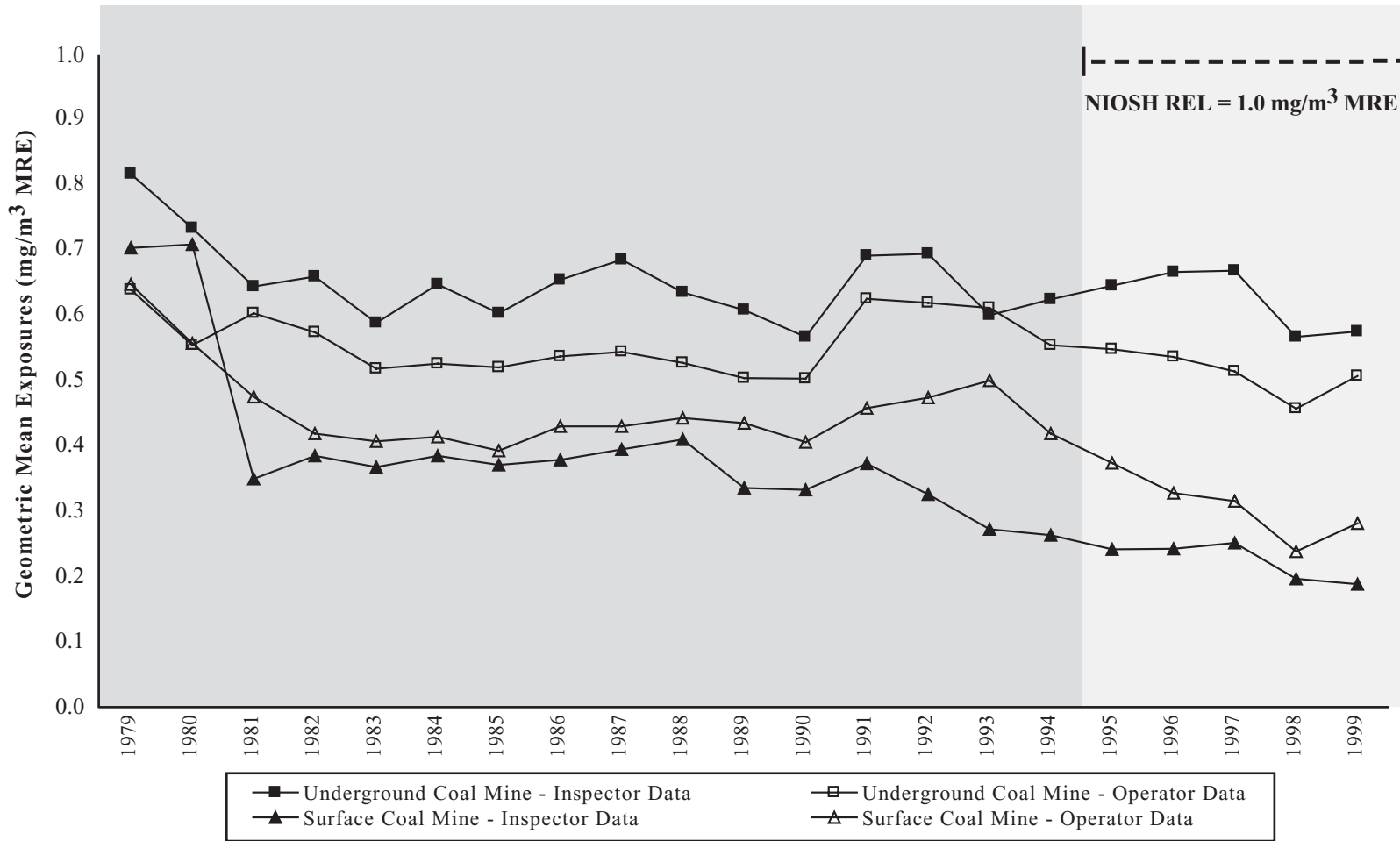
Table 2-13. Federal Black Lung Program: Number of beneficiaries and total payments by the Social Security Administration and Department of Labor, 1980-1999

Year	Social Security Administration (SSA)		Department of Labor (DOL)		SSA and DOL	
	Beneficiaries	Amount (dollars)	Beneficiaries	Amount (dollars)	Total Beneficiaries	Total 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

NOTE: The Social Security Administration (SSA) was assigned initial responsibility for administering the Black Lung benefits program. The Department of Labor (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 Department of Labor 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 2-7. Respirable coal mine dust: Geometric mean exposures by type of mine, MSHA inspector and mine operator samples, 1979-1999



PEL - permissible exposure limit REL - recommended exposure limit mg/m³ - milligrams per cubic meter MRE - Mining Research Establishment
 NOTE: In coal mining, for respirable dust containing less than 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. See appendices for source description, methods, and agents.

SOURCE: Mine Safety and Health Administration (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 facility, MSHA inspector and mine operator samples, 1979-1999

Type of Facility and Sample Source																		NIOSH REL = 1.0 mg/m ³ MRE				
		1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Underground Coal Mine Inspector Samples	GM (mg/m ³)	0.815	0.732	0.643	0.658	0.587	0.646	0.602	0.653	0.684	0.634	0.607	0.566	0.690	0.693	0.599	0.623	0.644	0.665	0.667	0.566	0.574
	No. of samples	1,897	13,125	13,533	13,882	13,588	12,884	13,115	13,010	13,118	14,372	13,608	12,450	10,912	10,709	9,582	10,334	11,919	11,826	16,441	23,689	33,419
	% > PEL	19.1	14.6	11.5	10.4	9.5	11.1	10.2	11.4	11.3	10.1	9.8	8.5	11.0	10.0	7.4	8.3	8.6	8.3	7.8	6.5	5.3
	% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.5	33.2	32.4	26.5	26.8
Underground Coal Mine Operator Samples	GM (mg/m ³)	0.638	0.553	0.602	0.573	0.517	0.525	0.519	0.536	0.543	0.526	0.503	0.502	0.624	0.618	0.610	0.553	0.547	0.535	0.513	0.456	0.506
	No. of samples	166,582	190,771	31,337	68,926	69,591	70,222	66,473	65,948	65,197	66,098	65,169	65,403	62,729	60,749	55,960	52,835	47,892	43,300	42,375	41,601	37,663
	% > PEL	17.0	15.4	14.7	12.8	10.5	10.2	10.0	10.7	10.8	9.4	8.9	8.5	11.9	10.9	10.8	10.5	10.3	9.6	9.2	8.9	9.0
	% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.2	30.7	29.4	28.9	31.2
Surface Coal Mine Inspector Samples	GM (mg/m ³)	0.702	0.707	0.349	0.384	0.367	0.384	0.370	0.378	0.394	0.409	0.335	0.332	0.372	0.325	0.272	0.263	0.241	0.242	0.251	0.196	0.188
	No. of samples	472	3,578	16,164	13,098	12,684	13,333	13,036	10,957	9,833	9,176	8,089	8,135	5,165	4,762	5,983	6,458	6,032	6,713	7,761	9,449	10,524
	% > PEL	16.3	14.8	5.2	5.7	6.3	7.7	5.9	5.9	5.9	6.4	4.5	4.4	4.6	4.1	2.8	2.4	1.8	1.4	1.3	1.0	1.1
	% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	7.3	7.3	5.5	6.1
Surface Coal Mine Operator Samples	GM (mg/m ³)	0.646	0.556	0.474	0.418	0.406	0.413	0.392	0.429	0.429	0.442	0.434	0.405	0.457	0.473	0.499	0.418	0.373	0.327	0.315	0.238	0.281
	No. of samples	38,479	47,107	16,730	37,744	35,548	37,998	32,467	26,016	20,346	14,547	12,546	11,701	10,202	6,158	5,153	5,278	4,563	4,830	4,959	4,543	4,480
	% > PEL	17.0	15.7	9.1	8.1	8.1	8.4	7.2	7.6	8.1	6.9	6.8	5.7	8.0	6.9	8.1	6.6	4.8	3.6	3.7	2.2	3.4
	% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.0	16.1	15.6	12.2	15.0

- indicates incalculable field

PEL - permissible exposure limit

REL - recommended exposure limit

GM - geometric mean

mg/m³ - milligrams per cubic meter

MRE - Mining Research Establishment

NOTE: In coal mining, for respirable dust containing less than 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 5% quartz, regardless of actual quartz content. See appendices for source description, methods, and agents.

SOURCE: Mine Safety and Health Administration (MSHA) coal mine inspector and mine operator dust data.

Coal Workers' Pneumoconiosis: Coal Mine Dust Exposures

Table 2-15. Respirable coal mine dust: Number of samples, geometric mean exposures, and percent exceeding designated occupational exposure limits by industries with elevated coal workers' pneumoconiosis mortality, MSHA inspector and mine operator samples, 1990-1999

Coal Workers' Pneumoconiosis Mortality, Selected States and Years, 1990-1999							
CIC	Industries with elevated PMRs and most frequently recorded on death certificates	Number of Deaths	PMR	Number of Samples	GM (mg/m ³)	% > PEL	% > REL 1995-1999
041	Coal mining	3,765	53.18	794,637	0.509	8.6	26.2
	All other industries	935		0	-	-	-
	TOTAL			794,637	0.509	8.6	26.2

- indicates incalculable field

CIC - Census Industry Code

PEL - permissible exposure limit

REL - recommended exposure limit

PMR - proportionate mortality ratio

GM - geometric mean mg/m³ - milligrams per cubic meter MRE - Mining Research Establishment

NOTE: In coal mining, for respirable dust containing less than 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 5% quartz, regardless of actual quartz content. See appendices for source description, methods, ICD codes, industry codes, agents, and list of selected states and years for which usual industry has been reported.

SOURCE: Mine Safety and Health Administration (MSHA) coal mine inspector and mine operator dust data. National Center for Health Statistics multiple cause of death data.

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, 1979-1999

MSHA Coal Mine District	All years		1979 – 1989			1990 – 1994			1995 - 1999 NIOSH REL = 1.0 mg/m ³ MRE			
	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)	40,660	0.203	22,717	0.219	2.7	9,277	0.184	2.4	8,666	0.186	2.6	8.9
District 2 (Bituminous coal mining regions in Pennsylvania)	289,781	0.512	208,709	0.515	9.8	40,164	0.564	9.5	40,908	0.451	5.8	23.9
District 3	258,453	0.558	184,655	0.590	12.7	38,816	0.531	7.5	34,982	0.436	5.2	23.3
Maryland	9,818	0.621	5,668	0.674	13.1	1,501	0.614	6.9	2,649	0.523	6.1	32.3
Ohio	85,691	0.606	66,440	0.672	16.3	9,792	0.479	6.0	9,459	0.372	4.7	22.5
Northern West Virginia	162,944	0.531	112,547	0.543	10.5	27,523	0.547	8.1	22,874	0.457	5.4	22.5
District 4 (Southern West Virginia)	451,111	0.551	306,083	0.572	14.6	76,284	0.531	10.6	68,744	0.485	9.0	27.4
District 5 (Virginia)	287,317	0.467	189,909	0.465	9.3	55,143	0.512	8.4	42,265	0.421	5.9	20.7
District 6 (Eastern Kentucky)	266,705	0.415	154,093	0.392	7.0	56,560	0.467	8.3	56,052	0.433	6.6	22.4
District 7	262,223	0.449	143,987	0.444	7.2	63,635	0.483	7.0	54,601	0.423	6.2	21.2
Central Kentucky	216,315	0.457	112,157	0.453	7.5	54,830	0.492	7.2	49,328	0.430	6.3	21.4
North Carolina	9	0.147	6	0.159	0.0	3	0.126	0.0	0	-	-	-
South Carolina	0	-	0	-	-	0	-	-	0	-	-	-
Tennessee	45,870	0.411	31,795	0.413	6.5	8,802	0.432	6.0	5,273	0.366	6.1	19.2
Northern Georgia	29	0.328	29	0.328	0.0	0	-	-	0	-	-	-
District 8	146,515	0.743	99,969	0.681	14.7	26,146	0.899	14.3	20,400	0.891	15.5	50.5
Illinois	131,785	0.794	90,886	0.731	15.6	23,477	0.974	15.0	17,422	0.934	15.4	52.0
Indiana	13,033	0.424	7,575	0.342	5.2	2,514	0.459	8.6	2,944	0.687	16.6	42.8
Iowa	886	0.384	813	0.388	5.3	73	0.344	0.0	0	-	-	-
Michigan	0	-	0	-	-	0	-	-	0	-	-	-
Minnesota	0	-	0	-	-	0	-	-	0	-	-	-
Northern Missouri	811	0.249	695	0.260	1.7	82	0.240	2.4	34	0.107	0.0	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, 1979-1999

MSHA Coal Mine District	All years		1979 – 1989			1990 – 1994			1995 - 1999 NIOSH REL = 1.0 mg/m ³ MRE			
	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	120,599	0.683	78,749	0.696	19.8	22,044	0.759	15.0	19,806	0.565	9.3	33.8
Alaska	246	0.338	181	0.408	6.6	48	0.237	2.1	17	0.123	0.0	0.0
Arizona	913	0.252	484	0.310	5.0	201	0.308	4.5	228	0.136	1.3	1.9
Arkansas	311	0.172	238	0.205	2.5	37	0.149	2.7	36	0.064	0.0	0.0
California	12	0.218	0	-	-	1	0.400	0.0	11	0.206	0.0	9.1
Colorado	38,040	0.844	25,744	0.845	24.1	6,616	0.915	16.4	5,680	0.765	10.4	40.7
Hawaii	0	-	0	-	-	0	-	-	0	-	-	-
Idaho	0	-	0	-	-	0	-	-	0	-	-	-
Kansas	510	0.216	383	0.235	2.6	49	0.190	0.0	78	0.152	1.3	1.4
Louisiana	105	0.186	14	0.163	0.0	39	0.228	0.0	52	0.165	0.0	0.0
Southern Missouri	647	0.236	453	0.255	2.0	56	0.160	0.0	138	0.216	1.4	7.0
Montana	1,720	0.296	1,096	0.368	7.2	213	0.250	2.8	411	0.181	2.7	5.6
Nebraska	0	-	0	-	-	0	-	-	0	-	-	-
Nevada	0	-	0	-	-	0	-	-	0	-	-	-
New Mexico	5,222	0.615	3,535	0.767	23.7	876	0.753	20.2	811	0.188	3.5	6.2
North Dakota	1,345	0.187	1,029	0.221	1.9	163	0.157	0.6	153	0.073	0.0	0.0
Oklahoma	4,857	0.331	2,972	0.345	6.9	985	0.325	6.7	900	0.297	3.4	9.8
Oregon	0	-	0	-	-	0	-	-	0	-	-	-
Texas	4,005	0.179	2,740	0.194	1.4	664	0.198	3.9	601	0.109	1.0	3.5
Utah	52,952	0.852	34,017	0.834	21.8	10,277	0.928	16.4	8,658	0.834	12.1	43.6
Washington	346	0.178	124	0.166	0.0	74	0.257	2.7	148	0.158	0.7	4.3
Wyoming	9,368	0.463	5,739	0.479	12.5	1,745	0.569	14.1	1,884	0.345	7.0	21.9

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, 1979-1999

	All years		1979 – 1989			1990 – 1994			1995 - 1999 NIOSH REL = 1.0 mg/m ³ MRE			
	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
MSHA Coal Mine District												
District 10 (Western Kentucky)	77,891	0.676	50,923	0.603	12.1	14,282	0.847	14.8	12,686	0.829	14.2	48.4
District 11	85,776	0.686	52,600	0.714	15.7	18,307	0.724	10.7	14,869	0.556	6.6	29.8
Alabama	85,776	0.686	52,600	0.714	15.7	18,307	0.724	10.7	14,869	0.556	6.6	29.8
Central and Southern Georgia	0	-	0	-	-	0	-	-	0	-	-	-
Florida	0	-	0	-	-	0	-	-	0	-	-	-
Mississippi	0	-	0	-	-	0	-	-	0	-	-	-
Puerto Rico	0	-	0	-	-	0	-	-	0	-	-	-
Virgin Islands	0	-	0	-	-	0	-	-	0	-	-	-
TOTAL	2,287,031	0.520	1,492,394	0.526	11.6	420,658	0.545	9.5	373,979	0.472	7.5	26.2

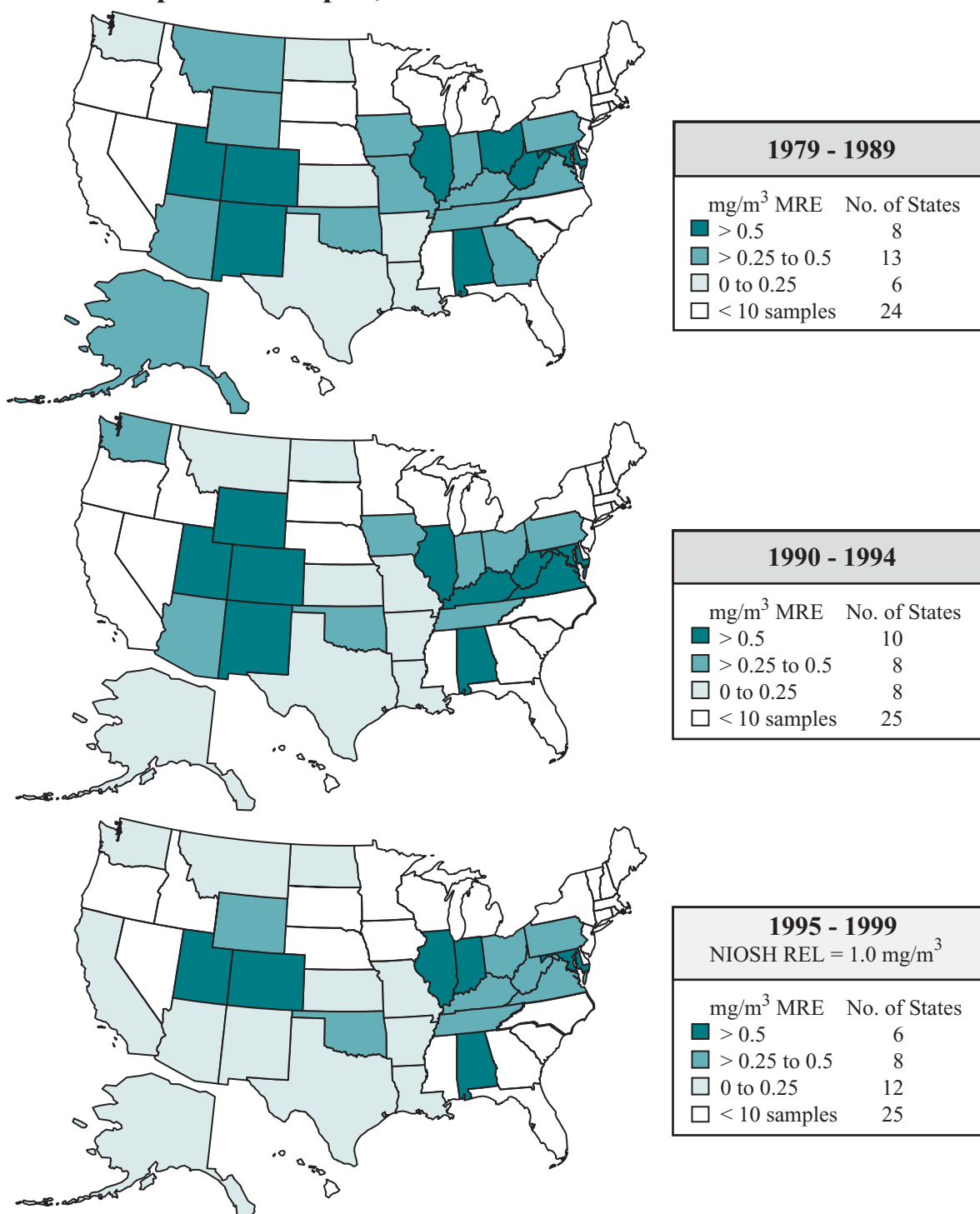
- indicates incalculable field PEL - permissible exposure limit REL - recommended exposure limit GM - geometric mean mg/m³ - milligrams per cubic meter
MRE - Mining Research Establishment

NOTE: In coal mining, for respirable dust containing less than 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 for respirable coal mine dust containing less than 5% quartz, regardless of actual quartz content. See appendices for source description, methods, and agents.

SOURCE: Mine Safety and Health Administration (MSHA) coal mine inspector and mine operator dust data.

Coal Workers' Pneumoconiosis: Coal Mine Dust Exposures

Figure 2-8. Respirable coal mine dust: Geometric mean exposures by state, MSHA inspector and mine operator samples, 1979-1999



PEL - permissible exposure limit REL - recommended exposure limit mg/m³ - milligrams per cubic meter MRE - Mining Research Establishment
 NOTE: In coal mining, for respirable dust containing less than 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. See appendices for source description, methods, and agents.
 SOURCE: Mine Safety and Health Administration (MSHA) coal mine inspector and mine operator dust data.

