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# **Section 5**

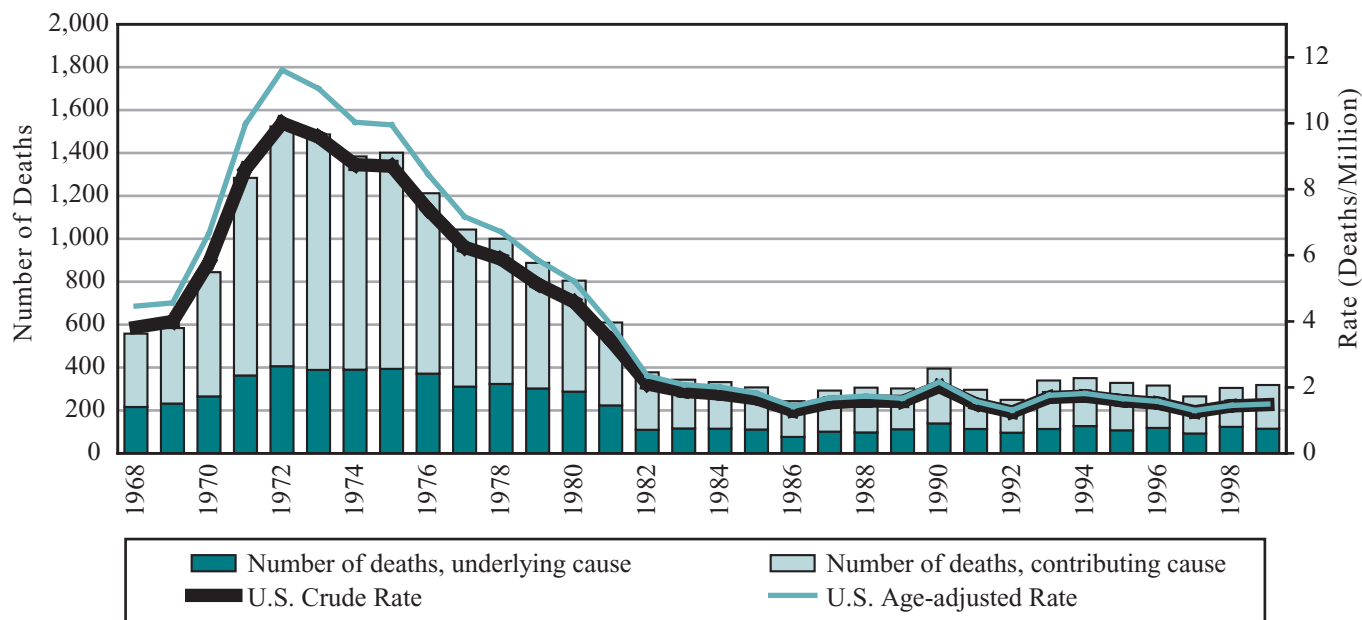
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## **Unspecified and Other Pneumoconioses and Selected Agent Exposures**



## Unspecified and Other Pneumoconioses: Mortality

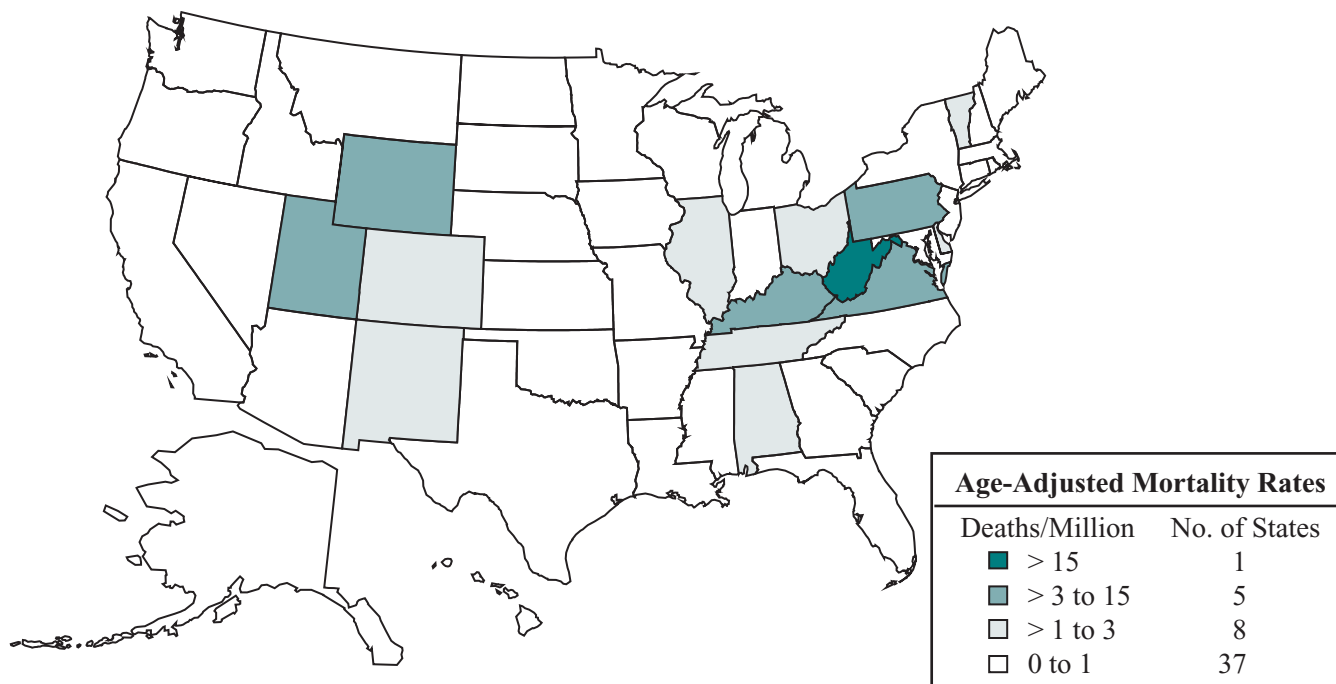
**Figure 5-1. Unspecified and other pneumoconioses: Number of deaths, crude and age-adjusted mortality rates, U.S. residents age 15 and over, 1968-1999**



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 5-2. Unspecified and other pneumoconioses: 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 5-1. Unspecified and other pneumoconioses: 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	395	35.2	385	10	367	26	2	-	2	1	7	48	114	152	71	76.0
1991	296	38.5	282	14	271	24	1	-	1	6	3	22	103	110	51	76.0
1992	249	38.6	234	15	231	18	-	1	-	-	8	19	76	104	41	76.0
1993	340	33.5	331	9	319	18	3	-	1	3	1	21	101	151	62	77.0
1994	351	36.2	343	8	330	21	-	-	-	-	1	25	81	173	71	78.0
1995	329	32.8	320	9	318	10	1	-	-	-	9	26	80	144	70	78.0
1996	316	37.7	306	10	295	16	5	-	-	2	5	28	76	132	73	78.0
1997	265	34.7	255	10	248	16	1	-	-	1	3	17	53	119	72	80.0
1998	305	40.3	293	12	288	14	3	-	1	1	6	24	65	137	71	79.0
1999	318	36.2	311	7	300	16	2	-	-	2	4	19	70	138	85	79.0
<b>TOTAL</b>	<b>3,164</b>	<b>36.3</b>	<b>3,060</b>	<b>104</b>	<b>2,967</b>	<b>179</b>	<b>18</b>	<b>1</b>	<b>5</b>	<b>16</b>	<b>47</b>	<b>249</b>	<b>819</b>	<b>1,360</b>	<b>667</b>	<b>78.0</b>

- 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.

*Unspecified and Other Pneumoconioses: Mortality*

**Table 5-2. Unspecified and other pneumoconioses: 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
<b>Crude Mortality Rate</b>							
1990	2.02	4.47	0.11	2.43	0.08	0.58	–
1991	1.50	3.20	0.15	2.21	0.08	0.28	–
1992	1.25	2.66	0.16	1.60	0.08	–	–
1993	1.69	3.77	0.10	1.67	–	0.78	–
1994	1.73	3.89	0.09	1.92	–	–	–
1995	1.60	3.70	0.10	0.90	–	0.25	–
1996	1.52	3.37	0.11	1.41	–	1.16	–
1997	1.26	2.79	0.11	1.38	–	0.23	–
1998	1.44	3.25	0.10	1.10	0.07	0.22	0.39
1999	1.48	3.38	0.08	1.34	–	0.42	–
<b>1990-1999</b>	<b>1.54</b>	<b>3.43</b>	<b>0.11</b>	<b>1.57</b>	<b>0.03</b>	<b>0.39</b>	<b>0.04</b>
<b>Age-Adjusted Mortality Rate</b>							
1990	2.16	5.80	0.09	4.60	0.09	2.10	–
1991	1.57	4.06	0.13	4.13	0.09	0.47	–
1992	1.31	3.37	0.14	3.12	0.09	–	–
1993	1.76	4.76	0.09	3.40	–	1.55	–
1994	1.81	4.98	0.07	3.85	–	–	–
1995	1.66	4.65	0.09	1.82	–	0.29	–
1996	1.57	4.22	0.10	2.72	–	2.13	–
1997	1.30	3.50	0.09	2.88	–	0.37	–
1998	1.45	3.91	0.09	2.09	0.09	0.62	0.50
1999	1.49	4.06	0.06	2.33	–	0.72	–
<b>1990-1999</b>	<b>1.59</b>	<b>4.29</b>	<b>0.09</b>	<b>3.05</b>	<b>0.04</b>	<b>0.87</b>	<b>0.06</b>

– 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.

*Unspecified and Other Pneumoconioses: Mortality*

**Table 5-3. Unspecified and other pneumoconioses: 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	
<b>Years of Potential Life Lost to Age 65</b>							
1990	365	10	65	–	–	–	440
1991	220	30	90	–	–	–	340
1992	235	15	10	–	–	–	260
1993	210	10	10	–	–	–	230
1994	125	–	15	–	–	–	140
1995	220	20	10	–	15	–	265
1996	205	40	5	–	15	–	265
1997	130	15	10	–	–	–	155
1998	220	10	30	5	–	5	270
1999	155	–	45	–	5	–	205
<b>TOTAL</b>	<b>2,085</b>	<b>150</b>	<b>290</b>	<b>5</b>	<b>35</b>	<b>5</b>	<b>2,570</b>
<b>Years of Potential Life Lost to Life Expectancy</b>							
1990	3,635	100	263	14	14	–	4,026
1991	2,652	182	269	14	14	–	3,131
1992	2,226	176	148	14	–	–	2,564
1993	2,901	135	154	–	36	–	3,226
1994	2,860	89	183	–	–	–	3,132
1995	2,921	127	86	–	29	–	3,163
1996	2,700	164	140	–	78	–	3,082
1997	2,143	117	137	–	14	–	2,411
1998	2,639	140	139	21	6	36	2,981
1999	2,683	59	189	–	30	–	2,961
<b>TOTAL</b>	<b>27,360</b>	<b>1,289</b>	<b>1,708</b>	<b>63</b>	<b>221</b>	<b>36</b>	<b>30,677</b>

– 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.

*Unspecified and Other Pneumoconioses: Mortality*

**Table 5-4. Unspecified and other pneumoconioses: 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	7	10	5	8	1	3	5	7	3	5	54
Alaska	-	-	-	-	-	-	-	-	-	-	-
Arizona	3	1	2	3	-	3	2	1	-	1	16
Arkansas	1	2	1	-	1	-	1	-	-	-	6
California	7	4	4	8	7	5	3	5	6	7	56
Colorado	1	3	3	7	4	5	7	4	6	3	43
Connecticut	2	2	4	4	-	-	1	1	2	-	16
Delaware	-	-	-	1	-	4	1	-	2	1	9
District of Columbia	-	1	-	-	-	-	1	-	-	-	2
Florida	5	10	11	5	7	8	11	5	8	1	71
Georgia	2	1	2	3	1	3	5	3	2	1	23
Hawaii	-	-	-	-	-	-	1	-	-	-	1
Idaho	-	-	-	-	-	-	1	-	-	-	1
Illinois	16	19	13	14	13	10	20	10	7	14	136
Indiana	6	4	4	3	1	5	6	6	-	8	43
Iowa	-	-	4	1	1	4	-	-	1	1	12
Kansas	-	3	-	1	1	-	1	-	-	-	6
Kentucky	47	32	34	14	26	29	14	24	25	38	283
Louisiana	3	4	-	-	1	-	1	-	2	-	11
Maine	-	-	-	-	-	-	2	-	-	-	2
Maryland	4	4	1	1	5	6	3	2	3	3	32
Massachusetts	-	2	3	1	1	2	4	-	2	1	16
Michigan	8	3	7	5	4	3	4	3	5	6	48
Minnesota	1	1	1	1	-	-	-	1	1	-	6
Mississippi	-	-	-	-	2	1	-	1	-	-	4
Missouri	6	3	1	4	2	3	-	2	2	1	24
Montana	1	-	-	2	-	-	-	-	1	-	4
Nebraska	-	1	1	-	-	-	-	-	-	-	2
Nevada	-	-	-	3	-	-	-	-	1	1	5
New Hampshire	-	-	1	-	-	1	-	-	-	1	3
New Jersey	9	7	7	2	6	9	1	3	3	2	49
New Mexico	4	-	1	3	3	2	1	4	2	-	20
New York	10	3	9	7	6	3	8	4	1	5	56
North Carolina	4	2	4	2	3	1	2	1	4	5	28
North Dakota	1	-	-	-	-	-	-	-	-	1	2
Ohio	29	42	27	15	24	16	20	8	29	28	238
Oklahoma	2	1	2	2	1	1	-	-	-	2	11
Oregon	1	1	-	-	-	1	-	-	1	-	4
Pennsylvania	51	49	33	159	130	98	94	83	64	75	836
Rhode Island	-	-	-	-	-	-	-	-	-	-	-
South Carolina	-	3	-	-	-	-	-	-	-	-	3
South Dakota	1	-	-	-	-	-	-	-	-	-	1
Tennessee	11	8	3	5	5	6	-	2	7	3	50
Texas	6	1	3	4	-	3	6	3	2	6	34
Utah	5	1	2	3	7	6	7	12	2	6	51
Vermont	-	-	-	1	-	1	1	2	-	1	6
Virginia	17	7	4	10	36	32	15	9	36	26	192
Washington	4	3	3	1	1	-	1	-	-	-	13
West Virginia	118	58	44	36	49	50	60	54	68	58	595
Wisconsin	2	-	2	-	-	1	1	1	1	1	9
Wyoming	-	-	3	1	2	4	5	4	6	6	31
<b>TOTAL</b>	<b>395</b>	<b>296</b>	<b>249</b>	<b>340</b>	<b>351</b>	<b>329</b>	<b>316</b>	<b>265</b>	<b>305</b>	<b>318</b>	<b>3,164</b>

- 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.

## Unspecified and Other Pneumoconioses: Mortality

**Table 5-5. Unspecified and other pneumoconioses: 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			
	Deaths	Rank	Rate	Rank	Rate	Rank	Total	Rank	YPLL/death	Rank
Alabama	54	10	1.63	8	1.71	11	520	13	9.6	40
Alaska	-	-	-	-	-	-	-	-	-	-
Arizona	16	24	0.49	24	0.47	24	185	26	11.5	23
Arkansas	6	33	0.31	35	0.25	39	62	37	10.3	36
California	56	8	0.23	39	0.28	36	736	8	13.2	10
Colorado	43	15	1.48	11	1.95	8	360	19	8.4	45
Connecticut	16	24	0.61	20	0.58	19	192	25	12.0	21
Delaware	9	31	1.59	9	1.78	10	95	32	10.6	34
District of Columbia	2	43	0.43	26	0.44	27	77	35	38.3	1
Florida	71	7	0.62	19	0.47	24	761	7	10.7	33
Georgia	23	22	0.41	29	0.53	21	301	21	13.1	13
Hawaii	1	47	0.11	48	0.09	49	14	47	14.1	5
Idaho	1	47	0.12	47	0.12	48	8	48	8.4	45
Illinois	136	6	1.48	11	1.51	12	1,349	6	9.9	37
Indiana	43	15	0.95	15	0.96	16	464	16	10.8	32
Iowa	12	28	0.54	23	0.42	28	112	31	9.4	42
Kansas	6	33	0.30	37	0.27	38	68	36	11.3	25
Kentucky	283	3	9.38	2	9.46	3	3,141	3	11.1	28
Louisiana	11	29	0.34	32	0.37	31	151	28	13.7	9
Maine	2	43	0.21	41	0.19	42	23	44	11.3	25
Maryland	32	18	0.80	16	0.99	15	400	17	12.5	17
Massachusetts	16	24	0.33	33	0.32	35	206	24	12.9	14
Michigan	48	14	0.65	18	0.69	18	610	11	12.7	15
Minnesota	6	33	0.17	44	0.17	43	94	33	15.6	3
Mississippi	4	38	0.20	42	0.20	41	44	40	11.0	29
Missouri	24	21	0.58	22	0.52	22	339	20	14.1	5
Montana	4	38	0.60	21	0.57	20	35	41	8.7	44
Nebraska	2	43	0.16	45	0.14	46	28	42	14.1	5
Nevada	5	37	0.42	28	0.47	24	93	34	18.6	2
New Hampshire	3	41	0.33	33	0.37	31	27	43	8.9	43
New Jersey	49	13	0.77	17	0.78	17	624	10	12.7	15
New Mexico	20	23	1.59	9	1.84	9	213	23	10.6	34
New York	56	8	0.39	31	0.39	30	641	9	11.4	24
North Carolina	28	20	0.49	24	0.51	23	388	18	13.8	8
North Dakota	2	43	0.41	29	0.35	33	22	46	11.2	27
Ohio	238	4	2.74	7	2.74	7	2,618	4	11.0	29
Oklahoma	11	29	0.43	26	0.41	29	134	29	12.2	19
Oregon	4	38	0.16	45	0.16	44	50	39	12.5	17
Pennsylvania	836	1	8.66	3	7.70	4	8,131	1	9.7	39
Rhode Island	-	-	-	-	-	-	-	-	-	-
South Carolina	3	41	0.11	48	0.14	46	23	44	7.7	49
South Dakota	1	47	0.18	43	0.15	45	8	48	8.3	47
Tennessee	50	12	1.21	14	1.24	14	610	11	12.2	19
Texas	34	17	0.24	38	0.28	36	519	14	15.3	4
Utah	51	11	3.81	5	4.92	5	505	15	9.9	37
Vermont	6	33	1.31	13	1.37	13	57	38	9.6	40
Virginia	192	5	3.67	6	4.59	6	2,119	5	11.0	29
Washington	13	27	0.31	35	0.33	34	172	27	13.2	10
West Virginia	595	2	40.91	1	35.63	1	6,938	2	11.7	22
Wisconsin	9	31	0.23	39	0.22	40	119	30	13.2	10
Wyoming	31	19	8.66	3	10.61	2	249	22	8.0	48

- 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.



*Unspecified and Other Pneumoconioses: Mortality*

**Table 5-6. Unspecified and other pneumoconioses: Most frequently recorded industries on death certificate, U.S. residents age 15 and over, selected states and years, 1990-1999**

<b>CIC</b>	<b>Industry</b>	<b>Number of Deaths</b>	<b>Percent</b>
041	Coal mining	801	58.9
060	Construction	81	6.0
270	Blast furnaces, steelworks, rolling and finishing mills	31	2.3
392	Not specified manufacturing industries	27	2.0
040	Metal mining	18	1.3
351	Motor vehicles and motor vehicle equipment	18	1.3
010	Agricultural production, crops	16	1.2
842	Elementary and secondary schools	16	1.2
400	Railroads	15	1.1
961	Non-paid worker or non-worker or own home/at home	14	1.0
	All other industries	291	21.4
	Industry not reported	33	2.4
	<b>TOTAL</b>	<b>1,361</b>	<b>100.0</b>

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 5-7. Unspecified and other pneumoconioses: Most frequently recorded occupations on death certificate, U.S. residents age 15 and over, selected states and years, 1990-1999**

<b>COC</b>	<b>Occupation</b>	<b>Number of Deaths</b>	<b>Percent</b>
616	Mining machine operators	727	53.4
889	Laborers, except construction	63	4.6
453	Janitors and cleaners	28	2.1
019	Managers and administrators, n.e.c.	27	2.0
575	Electricians	24	1.8
783	Welders and cutters	22	1.6
633	Supervisors, production occupations	21	1.5
869	Construction laborers	19	1.4
473	Farmers, except horticulture	18	1.3
804	Truck drivers	18	1.3
	All other occupations	365	26.8
	Occupation not reported	29	2.1
	<b>TOTAL</b>	<b>1,361</b>	<b>100.0</b>

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.

*Unspecified and Other Pneumoconioses: Mortality*

**Table 5-8. Unspecified and other pneumoconioses: 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	801	42.37	39.51	45.43
040	Metal mining	18	5.19	3.07	8.20
252	Structural clay products	7	4.71	1.89	9.71
262	Miscellaneous nonmetallic mineral and stone products	7	3.22	1.29	6.63
271	Iron and steel foundries	8	2.36	1.02	4.64
250	Glass and glass products	11	2.02	1.01	3.62

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.

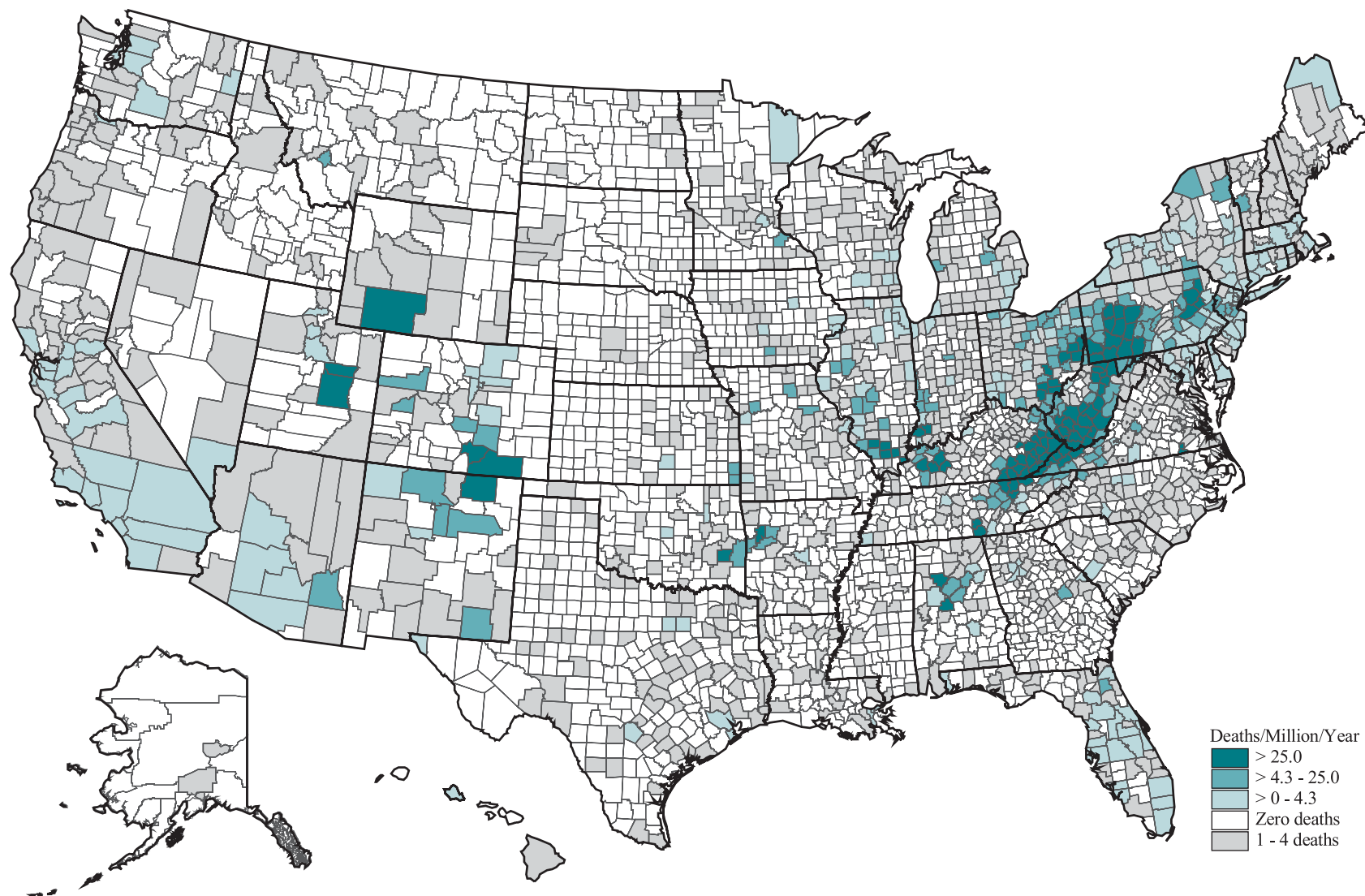
*Unspecified and Other Pneumoconioses: Mortality*

**Table 5-9. Unspecified and other pneumoconioses: 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	727	40.86	37.97	43.98
613	Supervisors, extractive occupations	17	18.40	10.70	29.44
768	Crushing and grinding machine operators	5	6.41	2.07	14.98
783	Welders and cutters	22	1.86	1.16	2.81
575	Electricians	24	1.66	1.06	2.47

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.

**Figure 5-3. Unspecified and other pneumoconioses: Age-adjusted mortality rates by county, U.S. residents age 15 and over, 1970-1999**

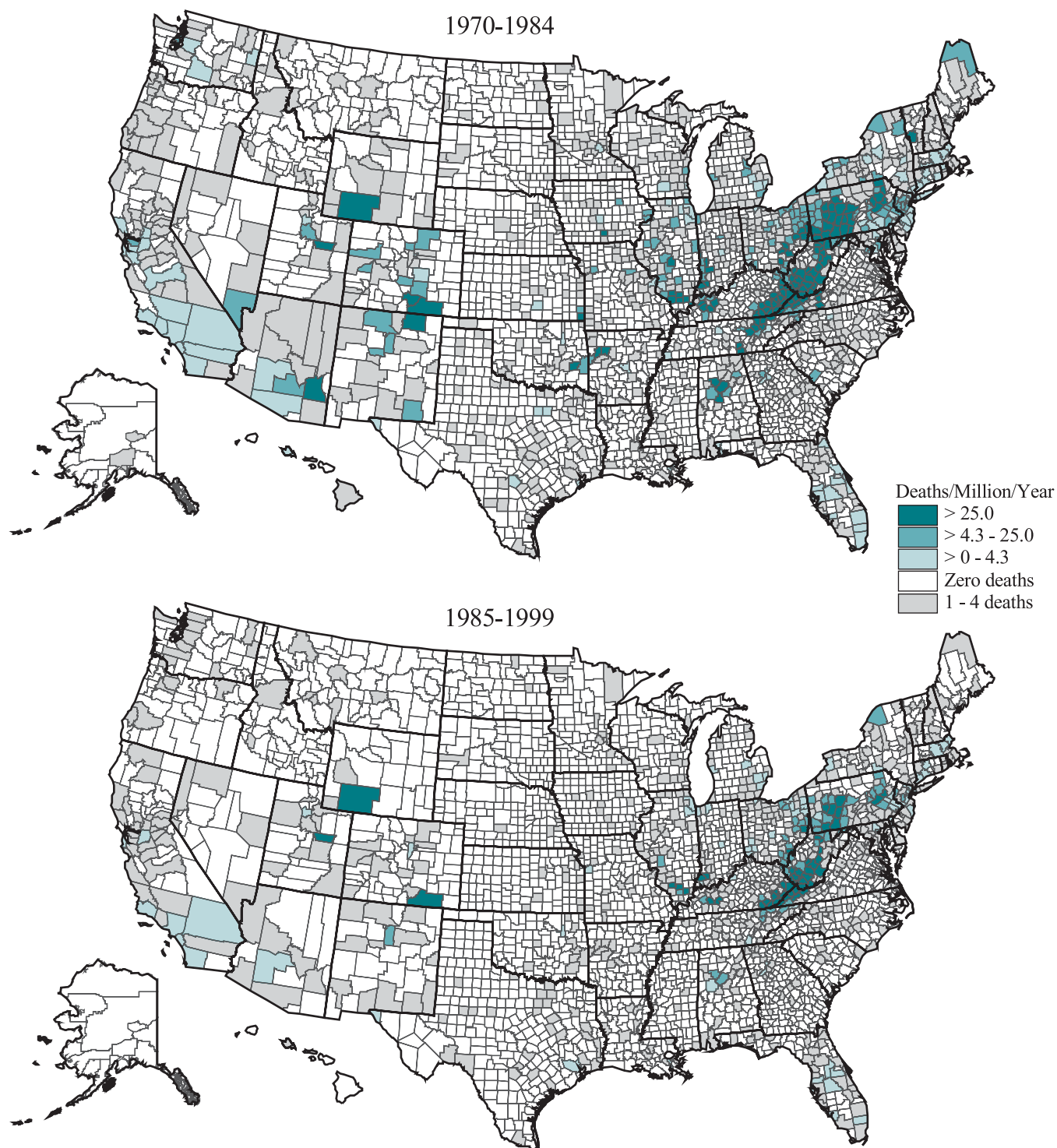


NOTE: Age-adjusted rates are not calculated for those counties with 1-4 deaths. See appendices for source description, methods, and ICD codes.

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

## Unspecified and Other Pneumoconioses: Mortality

**Figure 5-4. Unspecified and other pneumoconioses: 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.

## Unspecified and Other Pneumoconioses: Mortality

**Table 5-10. Unspecified and other pneumoconioses: 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
Carbon County	Utah	178.9	185.3	40	0.0
Harlan County	Kentucky	167.9	168.4	70	0.0
Boone County	West Virginia	160.6	148.1	46	0.0
Dickenson County	Virginia	155.8	139.8	29	0.0
Norton City	Virginia	143.7	119.2	6	0.0
Wyoming County	West Virginia	140.1	128.2	43	0.0
Sweetwater County	Wyoming	139.7	79.0	34	0.0
Logan County	West Virginia	133.5	130.4	65	0.0
Mingo County	West Virginia	125.3	103.9	39	0.0
Raleigh County	West Virginia	121.2	138.1	126	0.0
Wise County	Virginia	120.7	117.6	55	0.0
Fayette County	West Virginia	119.1	152.0	87	1.1
Las Animas County	Colorado	111.3	179.7	29	3.4
Bell County	Kentucky	110.2	114.1	41	0.0
Muhlenberg County	Kentucky	107.8	124.7	46	0.0
Leslie County	Kentucky	101.9	78.0	12	0.0
McDowell County	West Virginia	101.8	114.9	45	0.0
Franklin County	Illinois	96.4	145.0	70	0.0
Tazewell County	Virginia	93.5	93.2	52	0.0
Nicholas County	West Virginia	85.6	92.6	29	0.0
Butler County	Kentucky	80.4	90.4	12	0.0
Cambria County	Pennsylvania	78.5	102.7	202	1.0
Russell County	Virginia	76.7	69.8	24	0.0
Buchanan County	Virginia	69.8	54.4	20	0.0
Floyd County	Kentucky	64.9	59.8	30	0.0
Letcher County	Kentucky	62.5	58.3	18	5.6
Knox County	Kentucky	61.9	63.2	22	0.0
Saline County	Illinois	60.1	94.1	30	0.0
Pike County	Kentucky	60.1	49.6	42	0.0
Clay County	West Virginia	58.1	62.0	7	14.3
Mercer County	West Virginia	57.8	71.4	56	0.0
Webster County	West Virginia	54.4	65.5	8	0.0
Marion County	West Virginia	52.6	69.7	49	2.0
Pike County	Indiana	50.5	60.7	9	0.0
Meigs County	Ohio	50.3	58.7	16	0.0
Whitley County	Kentucky	44.9	45.5	18	0.0
Somerset County	Pennsylvania	44.6	52.5	49	0.0
Taylor County	West Virginia	40.5	50.3	9	0.0
Lee County	Virginia	38.2	45.2	13	0.0
Indiana County	Pennsylvania	37.6	35.8	39	0.0
Clearfield County	Pennsylvania	34.9	42.0	39	0.0
Upshur County	West Virginia	33.8	40.3	11	0.0
Perry County	Kentucky	33.2	28.2	10	0.0
Fayette County	Pennsylvania	31.8	38.8	68	0.0
Carbon County	Pennsylvania	30.4	39.8	28	3.6
Perry County	Illinois	29.7	40.1	10	0.0
Gibson County	Indiana	29.6	37.5	14	0.0
Schuylkill County	Pennsylvania	27.7	37.6	71	0.0
Armstrong County	Pennsylvania	26.5	32.7	29	0.0
Lincoln County	West Virginia	26.5	24.0	6	0.0
<b>Overall United States</b>		<b>1.6</b>	<b>1.5</b>	<b>4,615</b>	<b>3.4</b>

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 5-11 (page 1 of 4). Selected pneumoconiotic agents: Geometric mean exposures and percent exceeding designated occupational exposure limits, MSHA and OSHA samples, 1979-1999**

Agent	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
<b>Aluminum Oxide Fume and Dust - MSHA</b>																					
GM (mg/m <sup>3</sup> )	0.115	0.025	0.017	0.010	0.017	0.017	0.020	0.019	0.031	0.032	0.025	0.030	0.022	0.028	0.009	0.011	0.011	0.006	0.008	0.005	0.002
No. of samples	145	152	170	85	148	160	177	121	139	112	133	182	143	120	140	241	206	765	227	67	101
% > PEL	0.0	0.0	0.6	1.2	0.0	0.0	0.0	0.0	0.7	1.8	0.0	1.6	0.7	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Aluminum Oxide and Alpha Aluminum - OSHA</b>																					
GM (mg/m <sup>3</sup> )	0.209	1.16	0.196	1.235	0.396	0.035	0.007	0.016	0.004	0.034	0.031	0.050	0.003	0.019	0.013	0.035	0.049	0.031	0.002	0.008	0.022
No. of samples	22	15	6	27	11	70	96	28	24	50	47	41	44	16	42	41	35	13	145	85	65
% > PEL	18.2	0.0	0.0	18.5	18.2	0.0	4.2	3.6	0.0	2.0	2.1	0.0	0.0	0.0	2.4	0.0	5.7	7.7	0.0	0.0	0.0
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Antimony and Compounds - OSHA</b>																					
GM (mg/m <sup>3</sup> )	0.013	0.010	0.016	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.008	0.009	0.008	0.009	0.009	0.009	0.007	0.008	0.009	0.010	0.009
No. of samples	96	213	145	158	104	714	756	640	910	901	650	915	733	672	561	432	502	411	557	370	346
% > PEL	5.2	0.9	4.8	1.9	0.0	0.6	0.8	0.3	0.8	0.3	0.5	0.3	0.8	0.3	0.5	0.2	1.0	0.7	0.2	2.4	0.6
% > REL	5.2	0.9	4.8	1.9	0.0	0.6	0.8	0.3	0.8	0.3	0.5	0.3	0.8	0.3	0.5	0.2	1.0	0.7	0.2	2.4	0.6
<b>Beryllium Fume and Dust - MSHA</b>																					
GM (µg/m <sup>3</sup> )	0.334	0.164	0.176	0.183	0.189	0.161	0.164	0.215	0.172	0.189	0.166	0.160	0.169	0.159	0.150	0.152	0.152	0.153	0.162	0.166	0.169
No. of samples	65	53	83	72	171	155	168	81	81	97	75	64	48	39	107	217	183	582	113	44	88
% > PEL	13.8	0.0	1.2	4.2	2.9	0.0	0.0	1.2	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

See footnotes at end of table.



**Table 5-11 (page 2 of 4). Selected pneumoconiotic agents: Geometric mean exposures and percent exceeding designated occupational exposure limits, MSHA and OSHA samples, 1979-1999**

Agent	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
<b>Beryllium and Compounds - OSHA</b>																					
GM ( $\mu\text{g}/\text{m}^3$ )	0.043	0.079	0.037	0.031	0.044	0.031	0.035	0.026	0.034	0.039	0.031	0.033	0.032	0.031	0.034	0.029	0.027	0.029	0.029	0.027	0.032
No. of samples	31	71	110	151	102	698	683	579	864	991	711	911	707	676	595	452	408	349	558	372	410
% > PEL	6.5	7.0	2.7	0.7	2.9	1.4	2.9	0.3	1.9	1.2	0.8	1.4	0.3	0.6	1.3	0.4	0.0	0.9	0.5	0.8	1.2
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Carbon Black - OSHA</b>																					
GM ( $\text{mg}/\text{m}^3$ )	0.460	1.53	1.38	1.01	1.14	1.16	1.71	0.976	0.692	0.659	0.716	1.05	0.712	0.556	0.686	0.705	0.918	0.513	0.798	0.620	0.325
No. of samples	16	30	30	29	29	26	29	28	22	27	20	27	17	32	28	18	39	21	35	26	23
% > PEL	0.0	20.0	16.7	10.3	10.3	23.1	24.1	10.7	13.6	3.7	15.0	18.5	17.6	6.3	7.1	11.1	10.3	14.3	17.1	7.7	0.0
% > REL	0.0	20.0	16.7	10.3	10.3	23.1	24.1	10.7	13.6	3.7	15.0	18.5	17.6	6.3	7.1	11.1	10.3	14.3	17.1	7.7	0.0
<b>Cobalt Fume and Dust - MSHA</b>																					
GM ( $\mu\text{g}/\text{m}^3$ )	1.20	26.0	1.44	-	0.485	0.313	0.382	0.426	0.410	0.389	0.366	0.375	0.367	0.393	0.286	0.329	0.306	0.270	0.309	0.287	0.308
No. of samples	2	3	4	0	111	124	123	55	89	60	102	105	72	41	105	212	187	580	102	45	90
% > PEL	100.0	33.3	0.0	-	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.2	0.0	0.0	0.0
% > REL	100.0	33.3	0.0	-	1.8	0.0	0.8	0.0	0.0	0.0	0.0	1.0	1.4	0.0	0.0	1.9	0.0	0.2	1.0	0.0	0.0
<b>Cobalt, Metal, Fume and Dust - OSHA</b>																					
GM ( $\mu\text{g}/\text{m}^3$ )	4.32	7.41	5.74	6.19	7.52	3.19	3.83	3.59	3.07	3.10	2.61	3.60	4.01	3.29	2.96	2.53	2.96	1.87	1.84	2.13	1.97
No. of samples	51	71	168	288	222	829	785	809	990	1069	760	987	836	823	653	512	595	582	748	511	476
% > PEL	3.9	4.2	3.6	8.3	13.1	2.5	3.3	3.6	2.7	3.5	2.1	5.3	6.1	3.9	1.1	0.8	3.5	1.0	1.6	1.6	0.0
% > REL	5.9	12.7	6.5	14.2	15.8	4.0	5.6	4.9	4.4	5.1	2.1	5.3	6.1	3.9	3.5	1.8	5.0	2.6	2.8	2.2	0.0

See footnotes at end of table.



**Table 5-11 (page 3 of 4). Selected pneumoconiotic agents: Geometric mean exposures and percent exceeding designated occupational exposure limits, MSHA and OSHA samples, 1979-1999**

Agent	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
<b>Iron Oxide Fume - MSHA</b>																					
GM (mg/m <sup>3</sup> )	0.430	0.480	0.333	0.394	0.210	0.279	0.301	0.238	0.214	0.327	0.282	0.198	0.199	0.198	0.097	0.109	0.110	0.062	0.059	0.130	0.027
No. of samples	155	155	226	119	152	182	211	171	181	136	163	213	177	136	136	200	173	381	155	59	40
% > PEL	1.9	0.6	0.9	2.5	1.3	1.6	0.5	0.6	1.1	0.7	2.5	2.3	1.1	1.5	1.5	3.0	0.0	1.0	0.0	0.0	0.0
% > REL	3.2	5.2	2.2	4.2	4.6	3.3	4.7	2.3	5.0	3.7	5.5	5.2	3.4	5.9	4.4	4.0	2.9	3.4	2.6	0.0	0.0
<b>Iron Oxide Fume - OSHA</b>																					
GM (mg/m <sup>3</sup> )	1.33	1.10	0.974	0.924	0.514	0.421	0.456	0.356	0.245	0.277	0.502	0.360	0.264	0.261	0.280	0.301	0.406	0.238	0.315	0.333	0.279
No. of samples	575	901	1204	1347	1303	1315	1759	1586	1540	1818	1674	1760	1338	1258	1146	925	859	968	986	833	668
% > PEL	6.3	5.4	5.7	5.3	3.4	3.2	4.3	1.3	2.4	2.7	5.0	3.4	2.5	2.0	1.9	3.7	2.9	3.9	2.7	3.4	1.8
% > REL	18.3	16.5	17.1	13.8	9.7	10.7	12.5	6.6	6.9	8.0	13.4	10.1	6.3	6.1	5.9	7.4	6.8	6.9	5.5	7.9	5.5
<b>Talc, Nonfibrous, &lt; 1% quartz - MSHA</b>																					
GM (mppcf)	7.98	5.39	3.93	5.97	1.70	2.08	2.87	4.75	5.41	4.90	5.66	8.11	3.41	2.55	6.50	-	-	26.0	3.00	-	-
No. of samples	56	35	61	33	68	22	14	29	18	30	24	9	6	13	11	0	0	5	1	0	0
% > PEL	14.3	8.6	4.9	6.1	7.4	9.1	7.1	3.4	11.1	6.7	8.3	33.3	0.0	0.0	18.2	-	-	40.0	0.0	-	-
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Tin, inorganic compounds except oxide, as Sn - OSHA</b>																					
GM (µg/m <sup>3</sup> )	6.76	5.84	8.66	5.25	8.64	4.88	5.03	10.4	6.70	5.80	4.94	5.02	7.32	7.36	10.8	4.58	11.3	3.60	9.25	4.22	4.40
No. of samples	124	130	63	46	27	57	99	62	69	88	46	182	111	79	51	75	52	125	37	66	45
% > PEL	1.6	0.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0
% > REL	1.6	0.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0

See footnotes at end of table.

**Table 5-11 (page 4 of 4). Selected pneumoconiotic agents: Geometric mean exposures and percent exceeding designated occupational exposure limits, MSHA and OSHA samples, 1979-1999**

Agent	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
<b>Titanium Dioxide Fume and Dust - MSHA</b>																					
GM ( $\mu\text{g}/\text{m}^3$ )	1.48	4.11	6.49	2.57	3.70	2.42	3.43	3.22	4.95	7.22	7.27	4.24	6.48	3.73	1.29	1.37	1.06	0.677	0.822	1.55	0.488
No. of samples	111	56	116	97	124	129	145	100	123	104	106	145	108	55	119	215	188	578	128	49	86
% > PEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Welding Fumes (total particulate) - MSHA</b>																					
GM ( $\text{mg}/\text{m}^3$ )	2.39	1.59	1.07	0.931	0.907	0.931	1.57	1.34	1.98	1.77	1.53	0.169	1.95	0.070	1.00	-	-	-	-	-	-
No. of samples	165	175	212	117	94	47	79	45	31	44	20	5	2	1	1	0	0	0	0	0	0
% > PEL	13.3	9.1	4.7	2.6	3.2	4.3	11.4	0.0	16.1	6.8	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Welding Fumes (total particulate) - OSHA</b>																					
GM ( $\text{mg}/\text{m}^3$ )	7.05	3.34	3.05	2.33	2.75	4.12	2.75	1.09	2.36	2.12	3.55	2.18	1.67	2.22	1.79	1.46	1.20	1.00	0.978	1.20	0.975
No. of samples	7	35	35	128	48	27	38	32	146	33	230	435	629	585	457	261	230	480	216	304	203
% > PEL	-	-	-	-	-	-	-	-	-	-	52.5	34.7	25.4	24.4	36.8	-	-	-	-	-	-
% > REL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- indicates incalculable field

PEL - permissible exposure limit

REL - recommended exposure limit

GM - geometric mean

$\text{mg}/\text{m}^3$  - milligrams per cubic meter

$\mu\text{g}/\text{m}^3$  - micrograms per cubic meter

mppcf - millions of particles per cubic foot

NOTE: Pneumoconiotic agents with at least 300 total samples in MSHA or OSHA are presented. From March 1, 1989 to March 22, 1993, the OSHA PELs in force differed from those employed before and after those dates. NIOSH has designated beryllium and titanium dioxide as potential occupational carcinogens, and recommends reducing exposures to as low as feasible. The % > REL cannot be calculated for talc because the REL is in units of  $\text{mg}/\text{m}^3$ , but MSHA samples and analyzes for talc using units of millions of particles per cubic foot (mppcf). For welding fumes - OSHA, the % > PEL is based on fewer samples than the number reported for the years 1989 and 1993 because OSHA adopted a PEL for welding fumes that was enforced from March 1, 1989 through March 22, 1993. Samples collected in 1989 before March 1, or in 1993 after March 23 are not compared to a PEL. See appendices for source description, methods, and agents.

SOURCE: Mine Safety and Health Administration (MSHA) metal/nonmetal mine data. Occupational Safety and Health Administration (OSHA) Integrated Management Information System.