

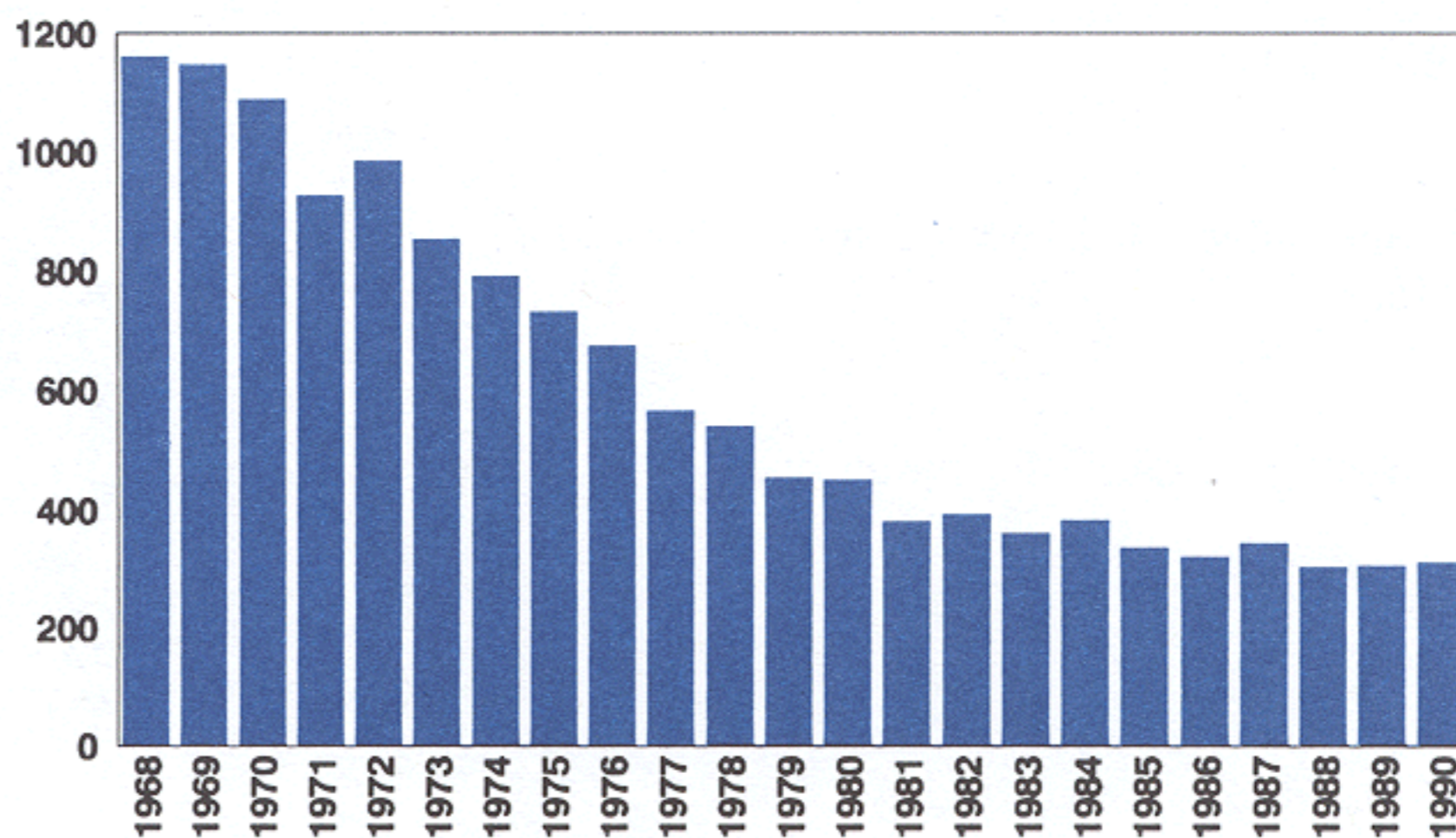
Silicosis includes ICD-8 codes 515.0 (silicosis) or ICD-8 code 010 (silicotuberculosis) for 1968-1978 and ICD-9 code 502 (pneumoconiosis due to other silica or silicates) for 1979-1990.

- The total number of deaths with mention of silicosis between 1968 and 1990 was 13,744. The annual number of deaths decreased from 1,157 in 1968 to 301 in 1988, with no further decline evident. About 98% of deaths with silicosis occurred in males. Racial distribution was 88% white, 11% black, and less than 1% other races.

- See Tables 4-3, 4-4 and 4-5 for data.

- See Appendix A for information about multiple cause of death data.

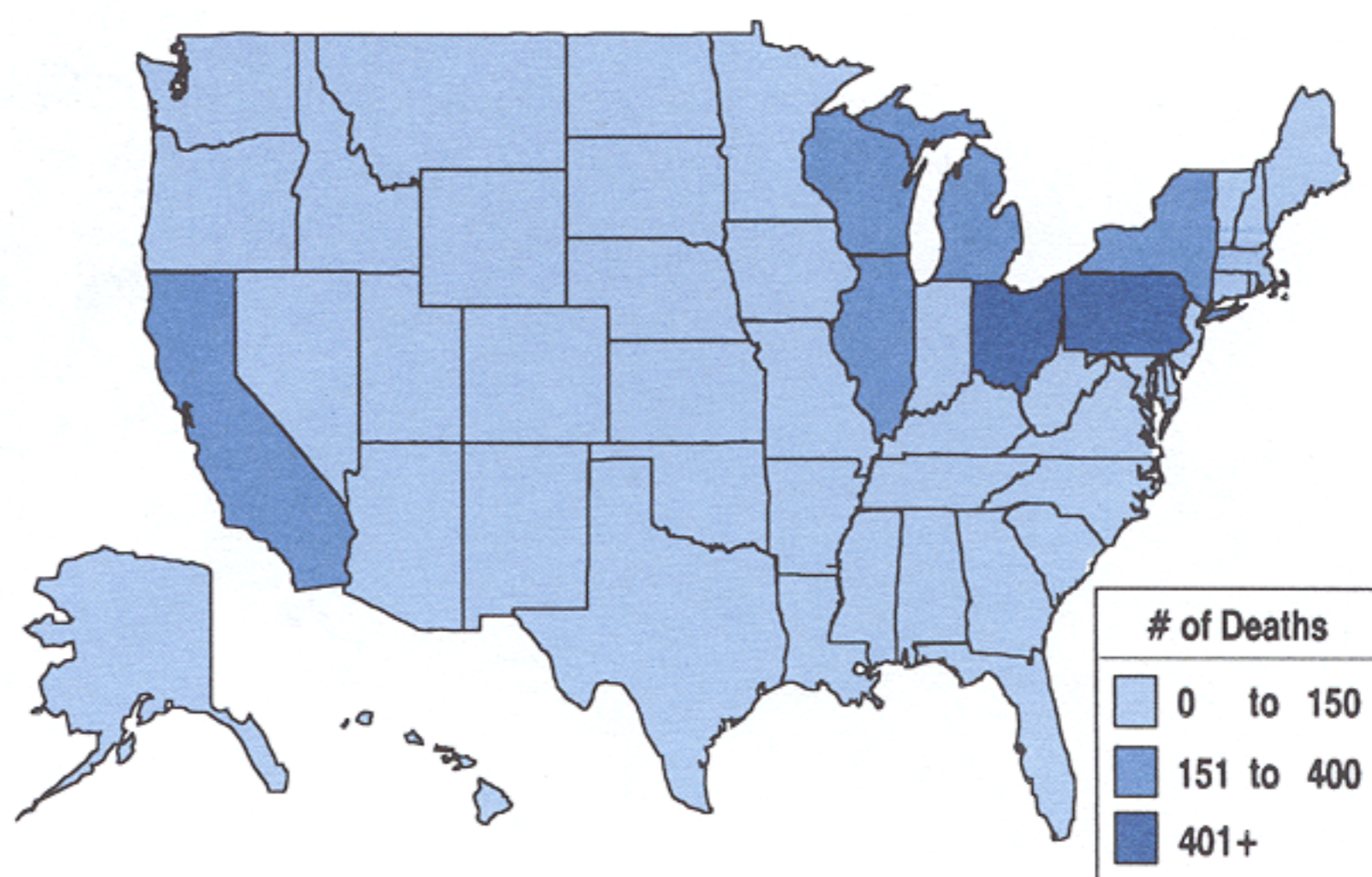
**Figure 4-1. Silicosis: number of deaths, U.S. residents age 15 and over, 1968-1990**



- Pennsylvania and Ohio had the highest number of deaths with silicosis (n = 755 and n = 456 deaths, respectively). California ranked third (n = 242 deaths).

- See Table 4-5 for data.

**Figure 4-2. Silicosis: number of deaths, U.S. residents age 15 and over, by state, 1979-1990**





# SILICOSIS

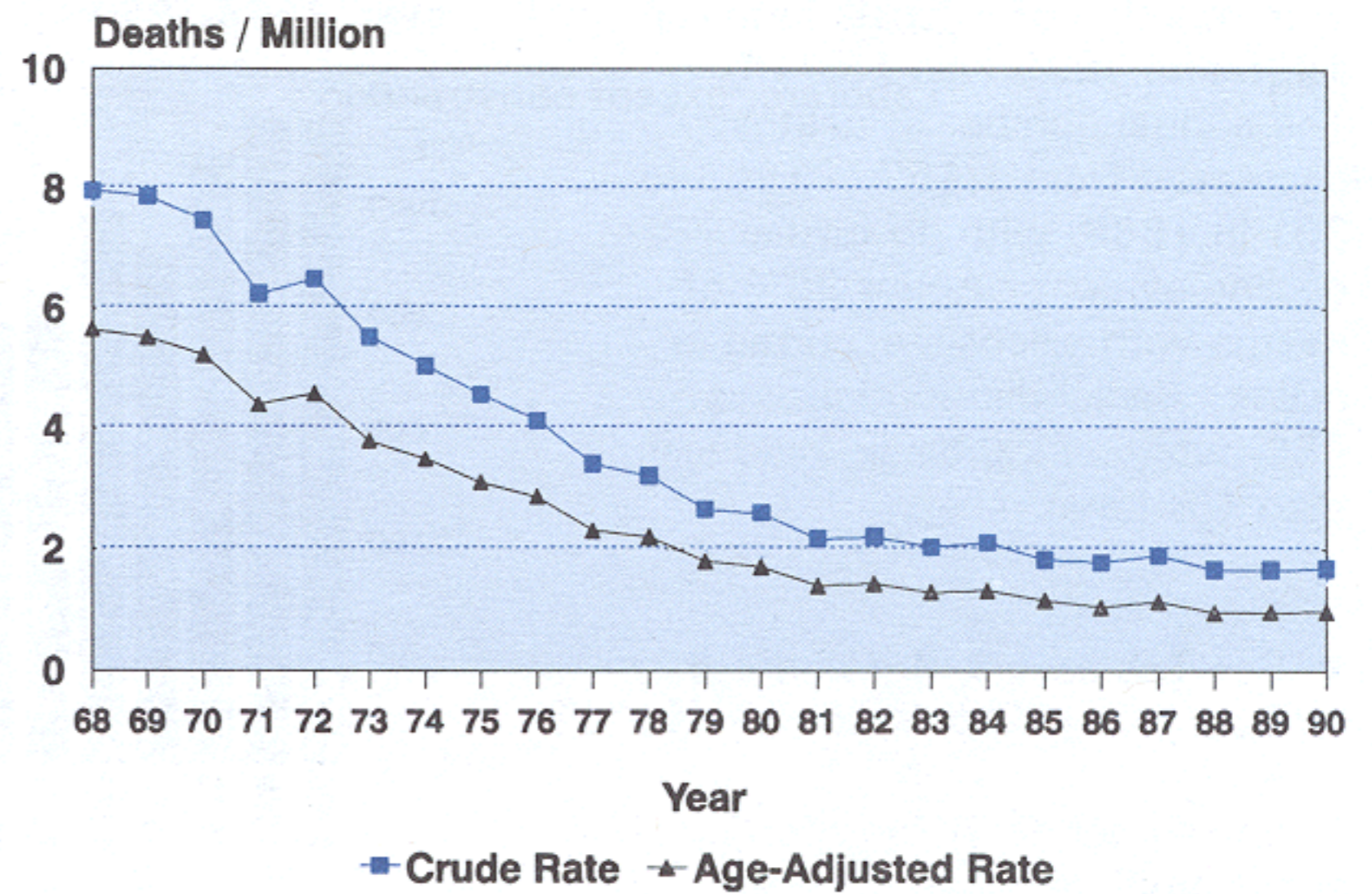
## Mortality

- Crude and age-adjusted mortality rates have declined approximately 80% from 1968 to 1988, but remained stable from 1988 to 1990.

- See Tables 4-6 and 4-7 for data.

- See Appendix B for methods.

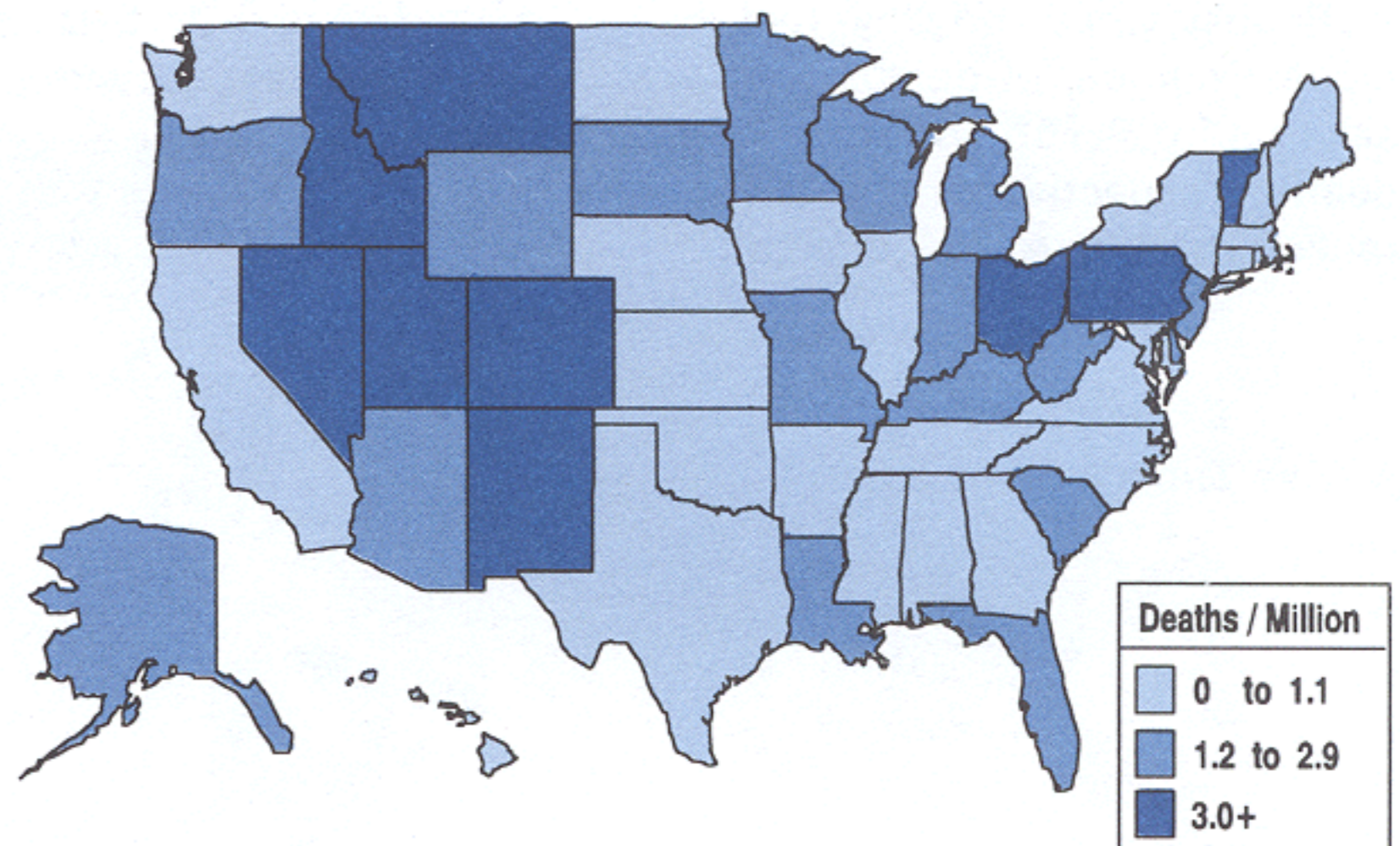
Figure 4-3. Silicosis: crude and age-adjusted mortality rates, U.S. residents age 15 and over, 1968-1990



- Vermont, Pennsylvania, and Colorado have the highest rates, with 10.3, 5.7 and 5.2 silicosis deaths per million population, respectively.

- See Table 4-10 for data.

Figure 4-4. Silicosis: crude mortality rates, U.S. residents age 15 and over, by state, 1989-1990





**Table 4-1. Silicosis: most frequently recorded occupations on death certificate, U.S. residents age 15 and over, selected states and years, 1985-1990**

COC	Occupation	Number	Percent
616	Mining machine operators	89	13.0
889	Laborers, except construction	84	12.3
473	Farmers, except horticultural	25	3.7
019	Managers and administrators, n.e.c.	24	3.5
453	Janitors and cleaners	20	2.9
719	Molding and casting machine operators	19	2.8
779	Machine operators, not specified	19	2.8
633	Supervisors, production occupations	18	2.6
869	Construction laborers	17	2.5
579	Painters, construction and maintenance	16	2.3
768	Crushing and grinding machine operators	16	2.3
	All other occupations	320	46.9
	Occupation not reported	16	2.3
	<b>TOTAL</b>	<b>683</b>	<b>100.0</b>

COC - 1980 Census Occupation Code

n.e.c. - not elsewhere classified

NOTE: See Appendix C for list of 25 states reporting usual occupation and years reporting.

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

**Table 4-2. Silicosis: most frequently recorded industries on death certificate, U.S. residents age 15 and over, selected states and years, 1985-1990**

CIC	Industry	Number	Percent
060	Construction	74	10.8
040	Metal mining	54	7.9
270	Blast furnaces, steelworks, finishing mills	47	6.9
262	Miscellaneous nonmetallic mineral and stone products	42	6.1
041	Coal mining	40	5.9
271	Iron and steel foundries	37	5.4
050	Nonmetallic mining and quarrying, except fuel	35	5.1
392	Not specified manufacturing industries	25	3.7
010	Agricultural production, crops	22	3.2
961	Homemaker, student, unemployed, volunteer	17	2.5
261	Pottery and related products	15	2.2
	All other industries	252	36.9
	Industry not reported	23	3.4
	<b>TOTAL</b>	<b>683</b>	<b>100.0</b>

CIC - 1980 Census Industry Code

NOTE: See Appendix C for list of 25 states reporting usual industry and years reporting.

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

## SILICOSIS

### Mortality

**Table 4-3. Silicosis: number of deaths, U.S. residents age 15 and over, by age, race, and sex, 1968-1990**

Years		1968-1978		1979-1990		1989-1990	
Total Deaths		9,431	%	4,313	%	610	%
Sex	Male	9,299	98.6	4,187	97.1	585	95.9
	Female	132	1.4	126	2.9	25	4.1
Race	White	8,479	89.9	3,670	85.1	514	84.3
	Black	932	9.9	621	14.4	93	15.2
	Other	20	0.2	22	0.5	3	0.5
Race/Sex	White Male	8,359	88.6	3,555	82.4	493	80.8
	White Female	120	1.3	115	2.7	21	3.4
	Black Male	920	9.8	610	14.1	89	14.6
	Black Female	12	0.1	11	0.3	4	0.7
	Other Male	20	0.2	22	0.5	3	0.5
	Other Female	0	0.0	0	0.0	0	0.0
Age	Years						
	15-24	10	0.1	6	0.1	2	0.3
	25-34	20	0.2	17	0.4	3	0.5
	35-44	75	0.8	62	1.4	10	1.6
	45-54	446	4.7	172	4.0	25	4.1
	55-64	1,960	20.8	609	14.1	79	13.0
	65-74	3,524	37.4	1,450	33.6	167	27.4
	75-84	2,728	28.9	1,501	34.8	247	40.5
	85 and Over	668	7.1	496	11.5	77	12.6
	Mean	70.4		72.5		73.2	
Range	15-99		15-98		16-98		

NOTE: See Appendix B for methods. Percentages may not total to 100% due to rounding.

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

# SILICOSIS

## Mortality

**Table 4-4. Silicosis: number of deaths, U.S. residents age 15 and over, by state, 1968-1978**

State	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	TOTAL
Alabama	21	27	19	15	22	12	9	17	6	14	10	172
Alaska	-	4	1	-	-	1	-	-	1	-	-	7
Arizona	28	21	16	11	24	12	15	18	10	12	10	177
Arkansas	7	3	11	4	6	4	-	1	3	2	2	43
California	46	56	59	51	46	37	41	34	28	27	30	455
Colorado	26	31	32	28	16	22	26	21	23	13	13	251
Connecticut	13	12	16	6	10	6	9	10	10	3	5	100
Delaware	-	1	-	1	-	-	1	3	-	-	1	7
District of Columbia	1	1	-	-	6	1	-	1	3	1	-	14
Florida	13	14	18	13	8	20	16	16	15	16	13	162
Georgia	4	5	11	6	8	9	11	-	9	12	7	82
Hawaii	-	-	-	-	2	1	1	1	-	-	1	6
Idaho	9	14	15	5	8	7	11	4	5	2	3	83
Illinois	27	20	17	19	24	20	15	21	13	6	9	191
Indiana	20	17	15	17	14	13	10	7	10	11	9	143
Iowa	-	6	3	2	6	4	4	2	-	1	2	30
Kansas	6	9	11	8	6	9	4	-	9	4	4	70
Kentucky	23	22	31	25	30	24	10	15	12	13	4	209
Louisiana	1	1	3	6	8	3	3	-	3	4	2	34
Maine	2	4	3	2	2	3	2	1	1	2	2	24
Maryland	14	9	13	7	6	8	7	7	6	6	4	87
Massachusetts	14	14	10	2	4	11	9	13	9	11	9	106
Michigan	55	52	43	34	32	38	25	35	24	20	20	378
Minnesota	18	13	6	5	12	3	9	11	6	6	8	97
Mississippi	-	1	1	1	-	2	3	4	1	1	-	14
Missouri	7	14	5	8	16	12	10	7	13	9	11	112
Montana	17	13	18	13	10	17	10	6	9	3	4	120
Nebraska	1	1	1	1	2	-	2	1	-	-	-	9
Nevada	7	3	11	6	4	4	4	8	5	7	2	61
New Hampshire	3	1	2	4	2	-	1	1	1	-	2	17
New Jersey	32	32	31	29	28	26	23	22	14	18	7	262
New Mexico	6	7	4	7	8	6	5	3	5	3	3	57
New York	59	56	44	57	42	46	38	27	21	31	26	447
North Carolina	13	19	18	15	24	11	13	13	16	11	11	164
North Dakota	1	2	-	-	-	-	-	1	-	1	-	5
Ohio	143	124	132	103	126	83	86	66	62	54	57	1,036
Oklahoma	10	4	7	5	6	2	8	5	1	3	-	51
Oregon	8	5	13	3	2	5	3	6	5	3	1	54
Pennsylvania	284	278	291	270	240	227	212	200	186	143	152	2,483
Rhode Island	1	1	1	-	-	-	1	2	3	1	-	10
South Carolina	5	2	4	-	-	2	6	4	2	3	2	30
South Dakota	3	3	3	1	6	1	3	1	1	-	1	23
Tennessee	18	22	9	9	16	10	4	13	10	6	7	124
Texas	8	15	7	9	12	6	7	11	10	7	13	105
Utah	10	10	5	11	12	13	8	8	11	9	5	102
Vermont	11	16	6	10	2	9	11	7	8	6	2	88
Virginia	38	35	15	15	38	22	22	17	20	13	14	249
Washington	17	15	11	9	14	12	9	12	6	10	10	125
West Virginia	75	87	71	55	58	47	44	32	32	17	24	542
Wisconsin	30	20	22	14	14	19	15	12	22	17	14	199
Wyoming	2	1	1	3	-	-	3	1	1	-	2	14
<b>TOTAL</b>	<b>1,157</b>	<b>1,143</b>	<b>1,086</b>	<b>925</b>	<b>982</b>	<b>850</b>	<b>789</b>	<b>728</b>	<b>671</b>	<b>562</b>	<b>538</b>	<b>9,431</b>

NOTE: See Appendix B for methods.

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

- indicates quantity zero.

# SILICOSIS

## Mortality

**Table 4-5. Silicosis: number of deaths, U.S. residents age 15 and over, by state, 1979-1990**

State	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
Alabama	11	5	2	4	4	4	1	7	6	6	4	3	57
Alaska	-	-	-	2	-	-	1	2	-	-	-	1	6
Arizona	5	11	12	10	9	7	3	7	5	1	6	5	81
Arkansas	1	2	4	2	4	-	2	-	2	-	2	-	19
California	21	29	22	26	19	22	22	14	17	19	16	15	242
Colorado	18	8	16	7	13	10	7	8	8	8	16	10	129
Connecticut	6	6	3	7	4	9	6	3	2	5	1	2	54
Delaware	-	1	-	1	-	-	-	-	-	1	1	1	5
District of Columbia	2	1	1	3	-	1	-	1	-	-	-	1	10
Florida	11	13	17	6	11	10	10	14	14	13	14	12	142
Georgia	7	1	6	2	7	5	9	9	6	6	7	4	69
Hawaii	-	-	-	1	-	1	-	1	-	-	-	-	3
Idaho	3	1	2	2	1	2	1	-	4	4	5	2	27
Illinois	13	15	11	21	11	17	15	11	15	12	9	10	160
Indiana	12	9	6	6	8	7	3	6	8	6	6	8	85
Iowa	-	3	1	1	3	2	2	3	5	2	1	2	25
Kansas	2	1	3	4	2	-	2	-	5	1	-	-	20
Kentucky	10	4	4	12	6	3	10	5	2	11	3	6	76
Louisiana	4	2	6	2	5	2	5	3	5	3	2	6	45
Maine	1	3	1	1	-	1	1	1	3	1	-	2	15
Maryland	8	6	6	3	4	2	3	2	2	2	-	3	41
Massachusetts	8	8	5	4	2	2	3	5	5	5	4	4	55
Michigan	19	23	15	21	17	12	15	14	16	15	14	12	193
Minnesota	6	10	11	9	3	13	9	11	2	8	3	5	90
Mississippi	1	3	2	1	1	1	2	-	1	-	1	3	16
Missouri	6	9	6	5	2	9	7	2	7	2	8	5	68
Montana	10	3	2	4	4	2	5	5	3	6	3	2	49
Nebraska	-	-	-	-	-	-	-	-	-	-	-	-	-
Nevada	2	1	1	2	2	2	4	2	3	1	6	3	29
New Hampshire	-	-	-	3	1	1	1	1	1	2	1	1	12
New Jersey	8	13	13	10	10	17	8	9	12	12	12	10	134
New Mexico	3	10	4	3	1	2	2	2	1	2	4	6	40
New York	23	17	20	11	22	17	16	9	27	12	16	15	205
North Carolina	11	8	9	4	11	11	12	9	12	9	7	5	108
North Dakota	-	-	-	-	-	1	1	-	-	1	-	-	3
Ohio	52	42	38	50	32	47	31	41	29	26	35	33	456
Oklahoma	3	1	-	-	2	2	-	3	4	-	1	4	20
Oregon	3	5	3	4	3	2	1	-	2	2	5	3	33
Pennsylvania	85	94	75	64	68	60	55	49	52	45	47	61	755
Rhode Island	4	1	-	4	1	1	1	1	1	-	-	1	15
South Carolina	5	2	4	4	3	1	3	3	2	2	3	5	37
South Dakota	-	2	2	3	1	1	2	2	-	1	1	1	16
Tennessee	9	8	6	4	11	9	5	5	6	5	6	3	77
Texas	5	16	-	12	8	11	5	14	10	12	4	7	104
Utah	3	5	3	6	4	9	9	4	2	1	6	2	54
Vermont	5	4	2	2	3	5	3	-	3	2	4	5	38
Virginia	7	8	10	7	7	7	5	8	11	2	4	3	79
Washington	14	10	2	10	6	1	8	6	6	6	4	-	73
West Virginia	10	7	9	7	4	12	5	3	7	5	2	6	77
Wisconsin	15	17	13	12	18	17	12	10	10	16	7	10	157
Wyoming	-	-	-	1	1	1	1	3	1	-	1	-	9
<b>TOTAL</b>	<b>452</b>	<b>448</b>	<b>378</b>	<b>390</b>	<b>359</b>	<b>381</b>	<b>334</b>	<b>318</b>	<b>342</b>	<b>301</b>	<b>302</b>	<b>308</b>	<b>4,313</b>

NOTE: See Appendix B for methods.

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

- indicates quantity zero.

**SILICOSIS**  
**Mortality**

**Table 4-6. Silicosis: crude mortality rates (per 1,000,000 population), U.S. residents age 15 and over, by race and sex, 1968-1990**

Year	Overall rate	White		Black	
		Males	Females	Males	Females
1968	7.92	16.52	0.19	15.00	0.34
1969	7.83	16.26	0.18	15.39	0.11
1970	7.44	15.70	0.19	12.13	0.11
1971	6.20	13.30	0.15	8.81	0.11
1972	6.45	13.33	0.17	12.63	-
1973	5.48	11.41	0.16	9.77	0.20
1974	4.99	10.56	0.11	8.10	0.20
1975	4.52	9.44	0.16	7.96	0.10
1976	4.09	8.54	0.12	7.49	-
1977	3.36	7.02	0.07	6.34	-
1978	3.16	6.41	0.19	6.36	0.09
1979	2.61	5.25	0.06	6.27	0.08
1980	2.55	4.99	0.18	6.22	-
1981	2.12	4.37	0.22	2.84	0.08
1982	2.16	4.35	0.04	5.00	-
1983	1.99	4.07	0.06	3.95	-
1984	2.06	4.09	0.11	4.89	0.07
1985	1.78	3.49	0.10	4.36	0.07
1986	1.73	3.31	0.10	4.78	-
1987	1.85	3.49	0.18	4.90	0.09
1988	1.61	2.98	0.11	5.22	0.17
1989	1.62	3.03	0.14	4.30	0.25
1990	1.63	3.14	0.10	4.33	0.08

NOTE: See Appendix B for methods.

SOURCE: National Center for Health Statistics multiple cause of death data tapes.  
U.S. Bureau of the Census: 1970-1990 population estimates of the U.S.

- indicates no deaths listed.

**SILICOSIS****Mortality****Table 4-7. Silicosis: age-adjusted mortality rates (per 1,000,000 population), U.S. residents age 15 and over, by race and sex, 1968-1990**

Year	Overall rate	White		Black	
		Males	Females	Males	Females
1968	5.64	12.52	0.13	14.50	0.34
1969	5.51	12.22	0.12	14.94	0.11
1970	5.21	11.75	0.14	11.60	0.12
1971	4.39	10.06	0.10	8.74	0.05
1972	4.58	10.10	0.13	12.69	-
1973	3.78	8.58	0.10	9.43	0.21
1974	3.48	7.99	0.07	8.09	0.20
1975	3.09	7.05	0.11	8.05	0.09
1976	2.86	6.49	0.08	7.59	-
1977	2.30	5.22	0.04	6.50	-
1978	2.19	4.80	0.14	6.56	0.06
1979	1.79	3.88	0.04	6.54	0.03
1980	1.70	3.60	0.12	6.54	-
1981	1.40	3.17	0.11	2.89	0.07
1982	1.42	3.10	0.02	5.32	-
1983	1.29	2.90	0.05	3.81	-
1984	1.31	2.80	0.06	5.27	0.10
1985	1.16	2.48	0.05	4.53	0.09
1986	1.04	2.24	0.05	4.42	-
1987	1.14	2.35	0.08	4.93	0.02
1988	0.96	1.94	0.05	5.01	0.13
1989	0.96	1.97	0.07	4.07	0.25
1990	0.98	2.05	0.04	4.24	0.08

NOTE: See Appendix B for methods.

SOURCE: National Center for Health Statistics multiple cause of death data tapes.  
U.S. Bureau of the Census: 1970-1990 population estimates of the U.S.

- indicates no deaths listed.



**Table 4-8. Silicosis: years of potential life lost to age 65, U.S. residents age 15 and over, by race and sex, 1968-1990**

Year	Total	White		Black	
		Males	Females	Males	Females
1968	2,535	2,105	50	330	50
1969	2,185	1,745	55	370	5
1970	2,315	1,920	35	315	15
1971	2,165	1,715	60	385	0
1972	2,110	1,560	50	450	0
1973	1,495	1,170	70	220	10
1974	1,740	1,345	20	325	35
1975	1,425	1,060	30	330	0
1976	1,360	1,050	15	295	-
1977	995	710	0	245	-
1978	1,190	840	60	290	0
1979	1,015	615	50	350	0
1980	865	505	50	295	-
1981	655	525	5	110	0
1982	745	440	0	260	-
1983	655	430	25	195	-
1984	670	395	25	235	15
1985	600	390	5	175	25
1986	450	365	40	45	-
1987	675	480	40	115	0
1988	495	285	5	190	15
1989	600	360	20	170	50
1990	615	430	0	160	25

NOTE: See Appendix B for methods.

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

- indicates no deaths listed.

**SILICOSIS****Mortality****Table 4-9. Silicosis: years of potential life lost to life expectancy, U.S. residents age 15 and over, by race and sex, 1968-1990**

Year	Total	White		Black	
		Males	Females	Males	Females
1968	14,264	11,059	191	1,397	75
1969	13,873	10,659	192	1,514	18
1970	13,773	10,617	210	1,220	26
1971	11,927	9,193	178	1,021	7
1972	12,555	9,216	226	1,435	-
1973	10,365	7,737	202	1,009	39
1974	10,182	7,684	120	988	58
1975	9,361	6,861	194	1,015	14
1976	8,857	6,536	141	968	-
1977	7,324	5,321	66	844	-
1978	7,300	5,123	267	930	12
1979	6,254	4,258	115	924	9
1980	5,786	3,871	230	847	-
1981	4,906	3,629	221	353	14
1982	5,152	3,499	33	753	-
1983	4,657	3,279	94	599	-
1984	4,815	3,219	136	772	28
1985	4,261	2,870	102	642	37
1986	3,836	2,723	126	453	-
1987	4,406	3,015	191	570	7
1988	3,698	2,416	106	638	35
1989	3,859	2,568	153	549	90
1990	3,989	2,761	92	572	37

NOTE: See Appendix B for methods.

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

- indicates no deaths listed.

**SILICOSIS**  
**Mortality**

**Table 4-10. Silicosis: number of deaths, crude and age-adjusted mortality rates (per 1,000,000 population), total years of potential life lost (YPLL), U.S. residents age 15 and over, by state, 1989-1990**

State	Deaths		Crude mortality		Age-adjusted mortality		YPLL to age 65		YPLL to life expectancy	
	Rate	Rank	Rate	Rank	Rate	Rank	Years	Rank	Years	Rank
Alabama	7	29	1.14	30	0.84	26	75	4	154	16
Alaska	1	44	1.48	23	3.31	4	0	34	8	44
Arizona	11	14	2.08	12	1.23	14	10	24	139	20
Arkansas	2	39	0.56	44	0.41	41	5	27	35	38
California	31	3	0.74	39	0.40	42	15	19	304	6
Colorado	26	5	5.19	3	3.59	2	15	19	273	7
Connecticut	3	36	0.58	43	0.29	45	0	34	30	39
Delaware	2	39	1.92	14	1.63	12	15	19	37	37
District of Columbia	1	44	0.97	37	0.51	38	0	34	8	44
Florida	26	5	1.26	25	0.80	28	130	2	470	3
Georgia	11	14	1.12	31	0.86	25	20	16	147	18
Hawaii	-	48	-	48	-	48	-	48	-	48
Idaho	7	29	4.84	6	2.51	6	0	34	73	30
Illinois	19	9	1.09	34	0.72	32	55	9	268	8
Indiana	14	11	1.65	18	1.05	18	20	16	181	13
Iowa	3	36	0.70	41	0.47	39	15	19	49	35
Kansas	-	48	-	48	-	48	-	48	-	48
Kentucky	9	18	1.58	20	1.04	19	40	12	140	19
Louisiana	8	22	1.28	24	1.14	16	25	15	134	21
Maine	2	39	1.05	35	0.55	36	0	34	22	41
Maryland	3	36	0.40	47	0.22	46	0	34	28	40
Massachusetts	8	22	0.84	38	0.38	43	5	27	84	28
Michigan	26	5	1.84	16	1.14	16	60	7	343	5
Minnesota	8	22	1.21	26	0.82	27	20	16	111	22
Mississippi	4	34	1.05	35	0.73	31	5	27	57	32
Missouri	13	12	1.64	19	0.91	22	35	14	179	14
Montana	5	32	4.31	7	1.67	10	0	34	43	36
Nebraska	-	48	-	48	-	48	-	48	-	48
Nevada	9	18	4.98	4	3.39	3	5	27	108	23
New Hampshire	2	39	1.16	29	0.71	33	0	34	22	41
New Jersey	22	8	1.84	16	0.90	24	10	24	227	10
New Mexico	10	17	4.96	5	2.24	9	5	27	88	26
New York	31	3	1.12	31	0.65	34	45	11	389	4
North Carolina	12	13	1.17	28	0.80	28	70	5	201	12
North Dakota	-	48	-	48	-	48	-	48	-	48
Ohio	68	2	4.06	8	2.31	8	175	1	895	2
Oklahoma	5	32	1.11	33	0.58	35	0	34	56	33
Oregon	8	22	1.86	15	0.76	30	0	34	70	31
Pennsylvania	108	1	5.74	2	2.83	5	85	3	1,250	1
Rhode Island	1	44	0.63	42	0.11	47	0	34	6	47
South Carolina	8	22	1.50	22	1.23	14	60	7	153	17
South Dakota	2	39	2.02	13	0.98	20	0	34	22	41
Tennessee	9	18	1.18	27	0.93	21	65	6	178	15
Texas	11	14	0.44	46	0.44	40	55	9	212	11
Utah	8	22	3.54	9	2.39	7	5	27	86	27
Vermont	9	18	10.31	1	4.63	1	0	34	78	29
Virginia	7	29	0.74	39	0.52	37	5	27	89	25
Washington	4	34	0.56	44	0.31	44	15	19	50	34
West Virginia	8	22	2.87	10	1.66	11	10	24	103	24
Wisconsin	17	10	2.28	11	1.48	13	40	12	239	9
Wyoming	1	44	1.51	21	0.91	22	0	34	8	44

NOTE: See Appendix B for methods.

SOURCE: National Center for Health Statistics multiple cause of death data tapes.  
U.S. Bureau of the Census: 1989-1990 population estimates of the U.S.

- indicates no deaths listed.



## SILICOSIS

### Mortality

**Table 4-11. Silicosis: proportionate mortality ratios (PMR), based on underlying cause of death, by usual occupation for selected states, 1985-1990**

COC	Occupation	Number of deaths	PMR	95% confidence interval	
				LCL	UCL
725	Miscellaneous metal and plastic processing machine operators	8	330.23	142.34	650.05
675	Hand molders, shapers, except jewelers	8	77.59	33.44	152.73
768	Crushing, grinding machine operators	7	48.05	19.30	99.08
787	Hand mold, cast, forming occupations	3	33.65	6.94	98.39
719	Molding, casting machine operators	8	26.25	11.31	51.67
616	Mining machine operators	37	17.19	11.94	23.91
599	Construction trades, n.e.c.	5	15.39	4.98	35.97
709	Grind, buff, polish machine operators	4	10.96	2.99	28.02
878	Machine feeders, offbearers	3	8.08	1.67	23.62
516	Heavy equipment mechanics	3	7.43	1.53	21.71
579	Painters, construction maintenance	9	5.70	2.61	10.81
563	Brickmasons and stonemasons	4	4.72	1.29	12.07
889	Laborers, except construction	48	4.51	3.30	6.04
518	Industrial machinery repairers	3	3.61	0.74	10.56
779	Machine operators not specified	10	3.24	1.56	5.97
783	Welders and cutters	5	3.21	1.04	7.51
633	Supervisors, production occupations	10	2.64	1.27	4.86
869	Construction laborers	7	1.88	0.76	3.88
796	Production inspectors, checkers, examiners	3	1.80	0.37	5.26
453	Janitors and cleaners	9	1.59	0.73	3.02
637	Machinists	5	1.50	0.49	3.51
913	Retired; with no other occupation listed	5	1.35	0.44	3.16
567	Carpenters	6	1.33	0.49	2.91
804	Truck drivers, heavy	7	1.20	0.48	2.48
019	Managers, administrators, n.e.c.	15	1.19	0.67	1.97

COC - 1980 Census Occupation Code

n.e.c. - not elsewhere classified

LCL - lower confidence limit

UCL - upper confidence limit

NOTE: See Appendix B for methods and Appendix C for list of selected states.

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

**Table 4-12. Silicosis: estimated number of discharges from short-stay nonfederal hospitals, 1970-1991**

Year	Number of cases
1970 . . . . .	6,000
1971 . . . . .	7,000
1972 . . . . .	6,000
1973 . . . . .	5,000
1974 . . . . .	4,000
1975 . . . . .	4,000
1976 . . . . .	5,000
1977 . . . . .	4,000
1978 . . . . .	2,000
1979 . . . . .	3,000
1980 . . . . .	—
1981 . . . . .	2,000
1982 . . . . .	3,000
1983 . . . . .	2,000
1984 . . . . .	—
1985 . . . . .	3,000
1986 . . . . .	3,000
1987 . . . . .	3,000
1988 . . . . .	—
1989 . . . . .	—
1990 . . . . .	—
1991 . . . . .	—

**NOTE:** Estimates have been rounded. No estimates are available for 1980, 1984, 1988, 1989, 1990 and 1991. 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.

**SOURCE:** National Center for Health Statistics National Hospital Discharge Survey.

# SILICOSIS

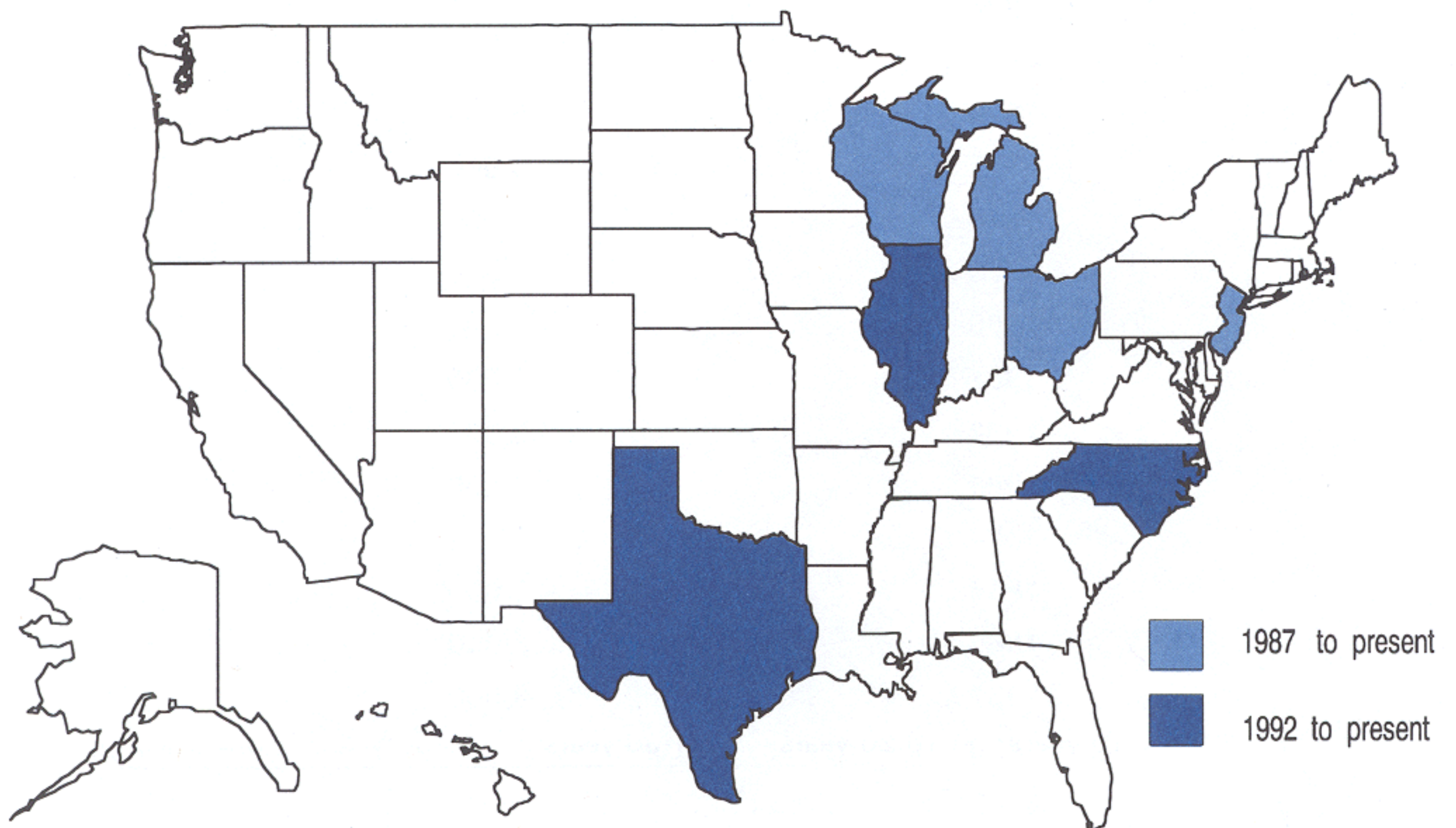
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## SENSOR

Figure 4-5 depicts states with silicosis surveillance and intervention programs funded under the NIOSH Sentinel Event Notification System for Occupational Risks (SENSOR) program. Since 1987, SENSOR silicosis programs have been under development in Michigan, New Jersey, Ohio, and Wisconsin. In October 1992, three additional states (Illinois, North Carolina, Texas) began developing SENSOR silicosis programs.

See Appendix A for more information about SENSOR.

Figure 4-5. States with SENSOR silicosis programs





**Table 4-13. Silicosis: number of confirmed cases reported, by state, race/ethnicity, and sex, 1988-1992\***

Race/ethnicity	Sex	MI	NJ	OH	WI	TOTAL
White	Male	129	61	46	19	255
	Female	6	16	6	-	28
Black	Male	90	14	12	17	133
	Female	-	1	-	-	1
Hispanic	Male	5	2	-	1	8
	Female	-	1	-	-	1
Asian	Male	-	-	-	-	-
	Female	-	-	-	-	-
Other	Male	-	14	-	-	14
	Female	-	-	-	-	-
Unknown	Male	1	2	3	1	7
	Female	-	-	-	-	-
<b>TOTAL</b>		<b>231</b>	<b>111</b>	<b>67</b>	<b>38</b>	<b>447</b>

\* Provisional data as of April 1993.

NOTE: MI (Michigan); NJ (New Jersey); OH (Ohio); WI (Wisconsin)

SOURCE: MJ Reilly, KD Rosenman, Michigan SENSOR; MJ Stanbury, New Jersey SENSOR; NA Migliozzi, ES Socie, Ohio SENSOR; HA Anderson, Wisconsin SENSOR.

- indicates no cases in category.

**Table 4-14. Silicosis: number of confirmed cases reported, by duration of exposure to silica by state, 1988-1992**

State	Duration of exposure					TOTAL
	< 10 years No. (%)	10-20 years No. (%)	21-30 years No. (%)	>30 years No. (%)	Unknown No. (%)	
Michigan	25 (10.8)	45 (19.5)	69 (29.9)	85 (36.8)	7 (3.0)	231
New Jersey	18 (16.2)	22 (19.8)	16 (14.4)	29 (26.1)	26 (23.4)	111
Ohio	2 (3.0)	10 (14.9)	11 (16.4)	8 (11.9)	36 (53.7)	67
Wisconsin	3 (7.9)	15 (39.5)	13 (34.2)	6 (15.8)	1 (2.6)	38
<b>TOTAL</b>	<b>48 (10.7)</b>	<b>92 (20.6)</b>	<b>109 (24.4)</b>	<b>128 (28.6)</b>	<b>70 (15.7)</b>	<b>447</b>

NOTE: See Table 4-13 footnotes.

SOURCE: MJ Reilly, KD Rosenman, Michigan SENSOR; MJ Stanbury, New Jersey SENSOR; NA Migliozzi, ES Socie, Ohio SENSOR; HA Anderson, Wisconsin SENSOR.

**SILICOSIS****SENSOR****Table 4-15. Silicosis: primary industries where silica exposure occurred for confirmed cases reported, by state, 1988-1992**

Industry	SIC	MI	NJ	OH	WI	TOTAL
<b>Agriculture, Forestry, and Fisheries</b>	01-09	-	-	-	-	-
<b>Mining</b>	10-14	9	9	2	1	21
<b>Construction</b>	15-17	1	7	1	1	10
<b>Manufacturing</b>	20-39					
Chemicals and allied products	28	1	2	-	-	3
Rubber and miscellaneous plastics products	30	-	2	5	-	7
Stone, clay, glass, and concrete products	32	14	51	11	1	77
Primary metal industries	33	185	20	22	32	259
Fabricated metal products, except machinery and transportation equipment	34	5	1	7	-	13
Industrial and commercial machinery and computer equipment	35	2	13	7	2	24
Transportation equipment	37	6	2	2	1	11
Measuring, analyzing, and controlling instruments; photographic, medical and optical goods; watches and clocks	38	3	1	-	-	4
Other manufacturing	22,26,36	1	2	-	-	3
<b>Transportation, Communications, Electric, Gas, and Sanitary Services</b>	40-49	1	1	-	-	2
<b>Wholesale Trade</b>	50-51	-	-	-	-	-
<b>Retail Trade</b>	52-59	-	-	-	-	-
<b>Finance, Insurance and Real Estate</b>	60-67	-	-	-	-	-
<b>Services</b>	70-89	-	-	-	-	-
<b>Public Administration</b>	91-97	-	-	-	-	-
<b>Unknown</b>		3	-	10	-	13
<b>TOTAL</b>		<b>231</b>	<b>111</b>	<b>67</b>	<b>38</b>	<b>447</b>

SIC - 1987 Standard Industrial Classification

MI (Michigan); NJ (New Jersey); OH (Ohio); WI (Wisconsin)

NOTE: See Table 4-13 footnotes.

SOURCE: MJ Reilly, KD Rosenman, Michigan SENSOR; MJ Stanbury, New Jersey SENSOR; NA Migliozi, ES Socie, Ohio SENSOR; HA Anderson, Wisconsin SENSOR.

- indicates no cases in category.

**SILICOSIS  
SENSOR**

**Table 4-16. Silicosis: primary occupations where silica exposure occurred for confirmed cases reported, by state, 1988-1992**

Occupation	COC	MI	NJ	OH	WI	TOTAL
<b>Managerial and Professional Specialty</b>	003-199	-	3	-	-	<b>3</b>
<b>Technical, Sales, and Administrative Support</b>	203-389	3	2	-	-	<b>5</b>
<b>Service</b>	403-469	1	1	2	-	<b>4</b>
<b>Farming, Forestry, and Fishing</b>	473-499	-	-	-	-	<b>-</b>
<b>Precision Production, Craft, and Repair</b>						
Millwrights	544	9	2	1	-	<b>12</b>
Mining occupations, n.e.c.	617	6	-	-	1	<b>7</b>
Supervisors, production occupations	633	8	2	-	-	<b>10</b>
Hand molders and shapers, except jewelers	675	21	-	1	-	<b>22</b>
All others *	503-699	8	16	4	-	<b>28</b>
<b>Operators, Fabricators, and Laborers</b>						
Grinding, abrading, buffing, and polishing machine operators	709	45	4	1	6	<b>56</b>
Molding and casting machine operators	719	20	5	4	11	<b>40</b>
Miscellaneous metal and plastic processing machine operators	725	7	1	7	-	<b>15</b>
Mixing and blending machine operators	756	3	6	1	2	<b>12</b>
Crushing and grinding machine operators	768	3	5	5	-	<b>13</b>
Miscellaneous machine operators, n.e.c.	777	7	4	1	-	<b>12</b>
Welders and cutters	783	5	-	3	2	<b>10</b>
Hand molding, casting, and forming occupations	787	1	7	2	1	<b>11</b>
Laborers, except construction	889	41	8	7	2	<b>58</b>
All others *	703-889	25	15	13	13	<b>66</b>
<b>Unknown</b>		18	30	15	-	<b>63</b>
<b>TOTAL</b>		<b>231</b>	<b>111</b>	<b>67</b>	<b>38</b>	<b>447</b>

COC - 1980 Census Occupation Codes

n.e.c. - not elsewhere classified

MI - Michigan; NJ - New Jersey; OH - Ohio; WI - Wisconsin

NOTE: See Table 4-13 footnotes.

SOURCE: MJ Reilly, KD Rosenman, Michigan SENSOR; MJ Stanbury, New Jersey SENSOR; NA Migliozi, ES Socie, Ohio SENSOR; HA Anderson, Wisconsin SENSOR.

- indicates no cases in category.

\* excludes categories shown separately.



## SILICOSIS

### Workers at Risk in Mining

**Table 4-17. Coal mining occupations and mine area, with the largest estimated number of workers potentially exposed to quartz dust, 1991**

Occupation	Mine area	Estimated workers
Bulldozer operator	Surface	8,381
Roof-bolter	Underground face	4,415
Shuttle car operator (on side)	Underground face	3,481
Scoop car operator	Underground face	3,060
Mechanic	Surface	3,054
Mechanic	Underground face	3,006
Laborer; Blacksmith	Surface	2,704
Section foreman	Underground face	2,651
Pan scraper operator	Surface	2,623
Coal truck driver	Surface	2,337
Continuous miner operator	Underground face	2,285
Utility man	Underground face	2,266
Mine foreman, Mine manager	Administration/Management	2,058
All other occupations potentially exposed to quartz		19,765
<b>TOTAL</b>		<b>61,986</b>

NOTE: Occupations with more than 2,000 workers are listed. See Appendix B for methods.

SOURCE: National Occupational Health Survey of Mining, NIOSH.

Mine Safety and Health Administration Address and Employment Data (1991).

Mine Safety and Health Administration Respirable Coal Mine Quartz Dust Data (1991).

**Table 4-18. Non-coal mining occupations and activity area, with the largest estimated number of workers potentially exposed to quartz dust, 1991**

Occupation	Activity area	Estimated workers
Mechanic	Maintenance	17,493
Supervisors	Miscellaneous	10,271
Laborer, bullgang	Maintenance	8,353
Truck driver	Load/haul/dump	6,618
Front-end loader operator	Load/haul/dump	5,127
Crusher, operator	Ore/mineral processing	4,794
Electrician	Maintenance	4,379
Complete load/haul/dump cycle	Load/haul/dump	3,629
Welder	Maintenance	2,946
Greaser, oiler	Maintenance	2,260
Cleanup man	Maintenance	2,248
Ball, rod, pebble mill operator	Ore/mineral processing	2,228
Laboratory technician	Miscellaneous	2,092
Bulldozer operator	Load/haul/dump	1,944
Slurry, mixing or pumping worker	Ore/mineral processing	1,566
Sizing and washing operations worker	Ore/mineral processing	1,535
Barge/boat/dredge operator	Load/haul/dump	1,362
Dryer operator; kiln operator	Ore/mineral processing	1,250
Dragline operator	Load/haul/dump	1,185
Utility man	Development and production	1,125
All other occupations potentially exposed to quartz		17,442
<b>TOTAL</b>		<b>99,847</b>

NOTE: Occupations with more than 1,000 workers are listed. See Appendix B for methods.

SOURCE: National Occupation Health Survey of Mining, NIOSH.

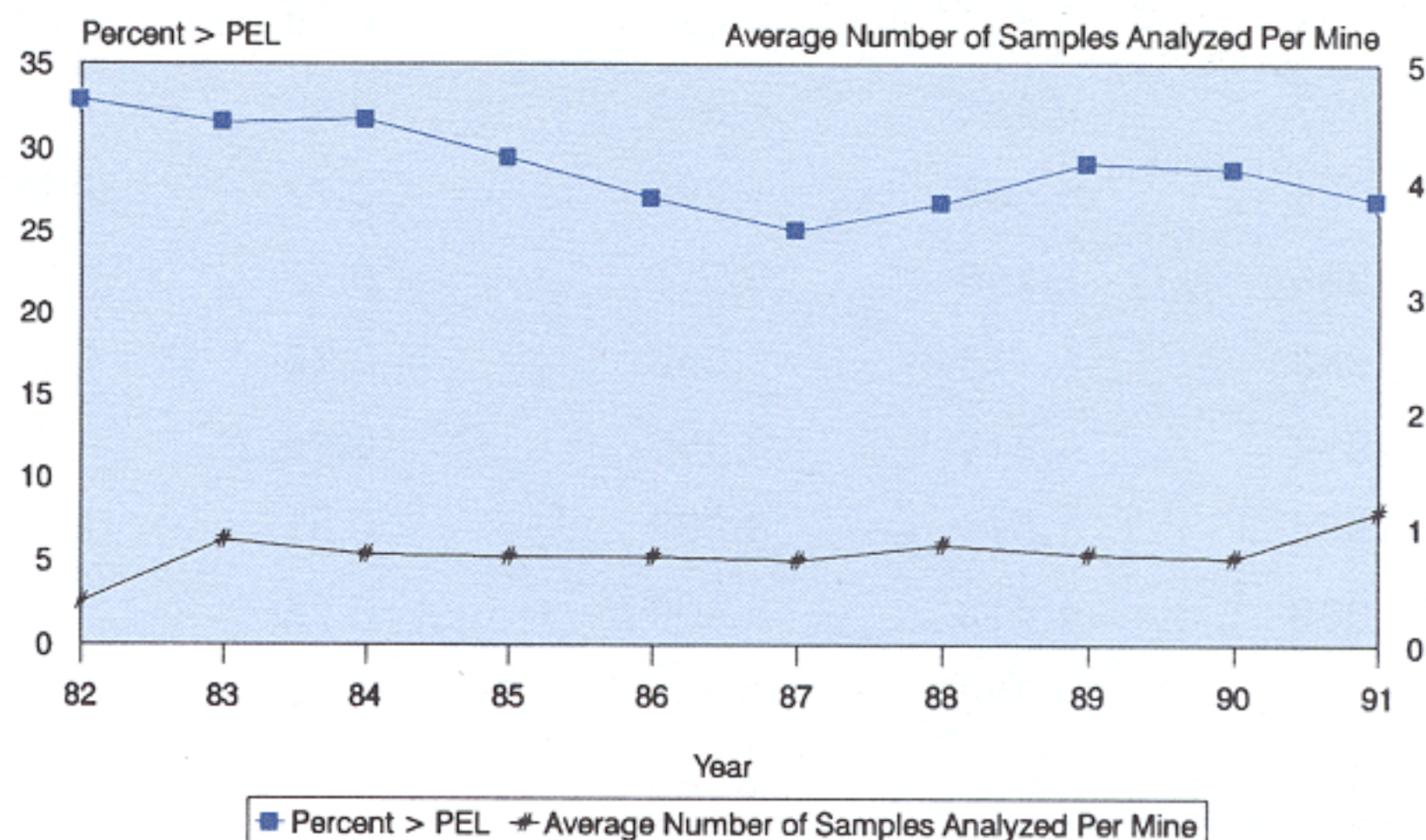
Mine Safety and Health Administration Address and Employment Data (1991).



- In the decade from 1982 to 1991, the average number of dust samples analyzed by MSHA, per underground and surface coal mines, for respirable quartz ranged from 0.4 to 1.1. These samples of respirable coal mine dust were collected by MSHA inspectors. The percent of respirable quartz samples above the permissible exposure limit (PEL) ranged between 25 and 33%.

- See Table 4-19 for data.

**Figure 4-6. Respirable quartz: average number of respirable coal mine dust samples analyzed for quartz by MSHA per mine, and percent above PEL, U.S. coal mines, 1982-1991**

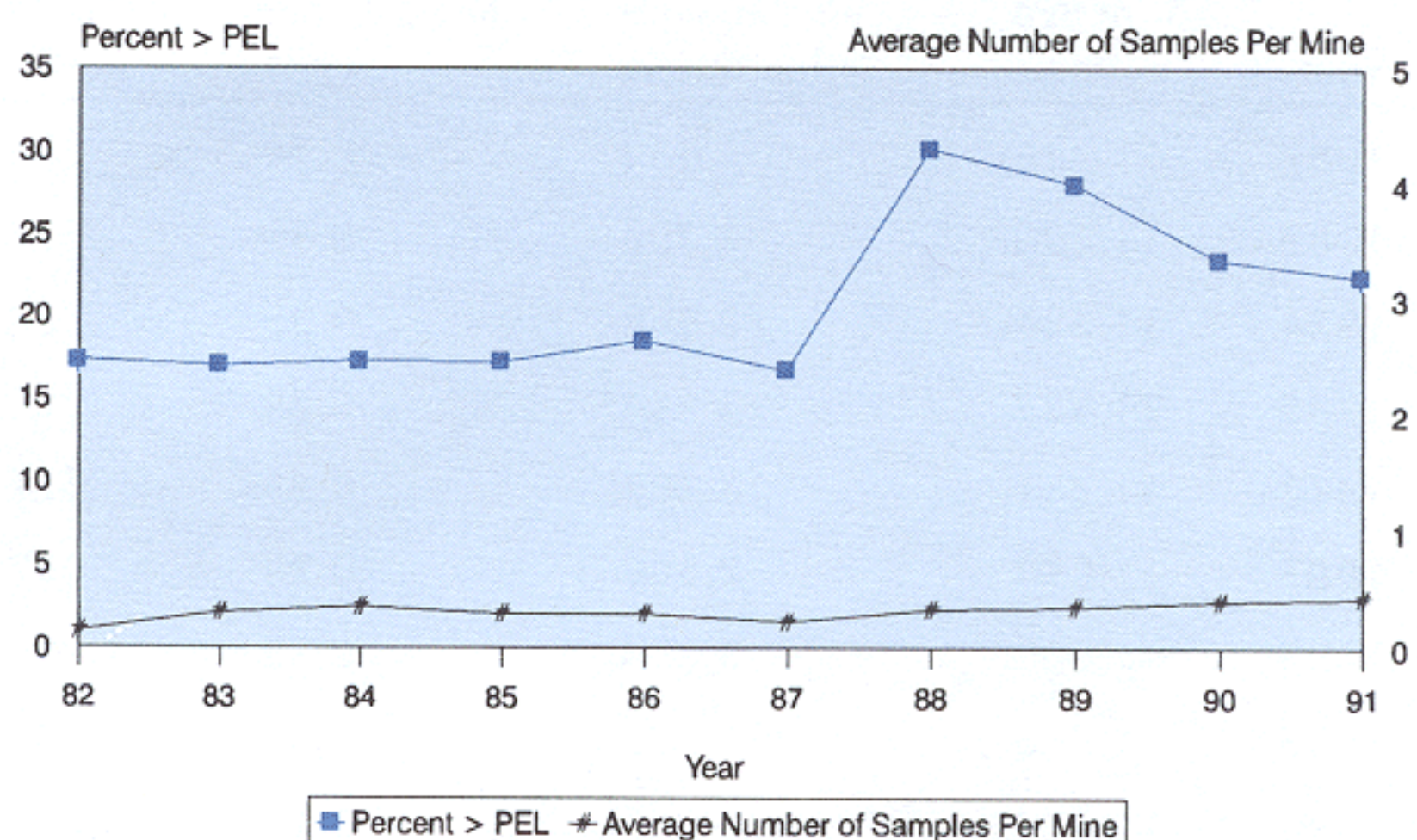


- MSHA's non-coal analytical laboratory changed to a different quartz reference standard on April 1, 1988, thereby affecting the percent of respirable quartz samples over the PEL. Since 1988, an annual decline in the percentage of respirable quartz samples above the PEL for non-coal mines is observed.

- See Table 4-20 for data.

- See Appendix A for additional information concerning the quartz reference standard and MIDAS respirable quartz data.

**Figure 4-7. Respirable quartz: average number of respirable dust samples with >1% quartz, collected by MSHA inspectors per mine, and percent above PEL, U.S. non-coal mines, 1982-1991**





## SILICOSIS

### Exposure

**Table 4-19. Respirable quartz: number of MSHA inspector samples analyzed for quartz and percent exceeding various levels, U.S. coal mines, 1982-1991**

Year	Number of active mines	Total number of samples	Average samples per mine	Samples > PEL	Percent of samples > PEL	Samples > 2x PEL	Percent of samples > 2x PEL
1982	6,861	2,491	0.36	818	32.84	359	14.41
1983	5,496	4,893	0.89	1,542	31.51	690	14.10
1984	5,538	4,291	0.77	1,360	31.69	601	14.01
1985	5,256	3,918	0.75	1,154	29.45	463	11.82
1986	5,115	3,853	0.75	1,041	27.02	436	11.32
1987	4,918	3,556	0.72	890	25.03	351	9.87
1988	4,674	3,983	0.85	1,064	26.71	466	11.70
1989	4,414	3,400	0.77	990	29.12	401	11.79
1990	4,320	3,208	0.74	922	28.74	409	12.75
1991	4,025	4,583	1.14	1,232	26.88	485	10.58

NOTE: Due to apparent differential accounting, some differences in annual number of samples will be observed when comparing NIOSH and MSHA tabulations of these data. MSHA analyzes a portion of each year's respirable coal mine dust inspector samples for quartz. At 100% quartz, the PEL is 0.1 mg/m<sup>3</sup> MRE. See Appendix A for additional information.

SOURCE: U.S. Department of Labor, Mine Safety and Health Administration (MSHA), Respirable coal mine quartz dust data, 1982-1991.

**Table 4-20. Respirable quartz: number of respirable dust samples with > 1% quartz, collected by MSHA inspectors and percent exceeding various levels, U.S. non-coal mines, 1982-1991**

Year	Number of active mines	Total number of samples with > 1% quartz	Average samples per mine	Samples > PEL	Percent of samples > PEL	Samples > 2x PEL	Percent of samples > 2x PEL
1982	11,298	1,636	0.14	283	17.30	110	6.72
1983	11,290	3,399	0.30	577	16.98	217	6.38
1984	11,294	3,968	0.35	683	17.21	267	6.73
1985	11,832	3,384	0.29	581	17.17	233	6.89
1986	11,741	3,383	0.29	624	18.45	234	6.92
1987	11,614	2,560	0.22	427	16.68	186	7.27
1988	11,808	3,855	0.33	1,164	30.19	500	12.97
1989	11,765	4,082	0.35	1,146	28.07	514	12.59
1990	11,838	4,695	0.40	1,099	23.41	458	9.76
1991	11,596	5,018	0.43	1,121	22.34	461	9.19

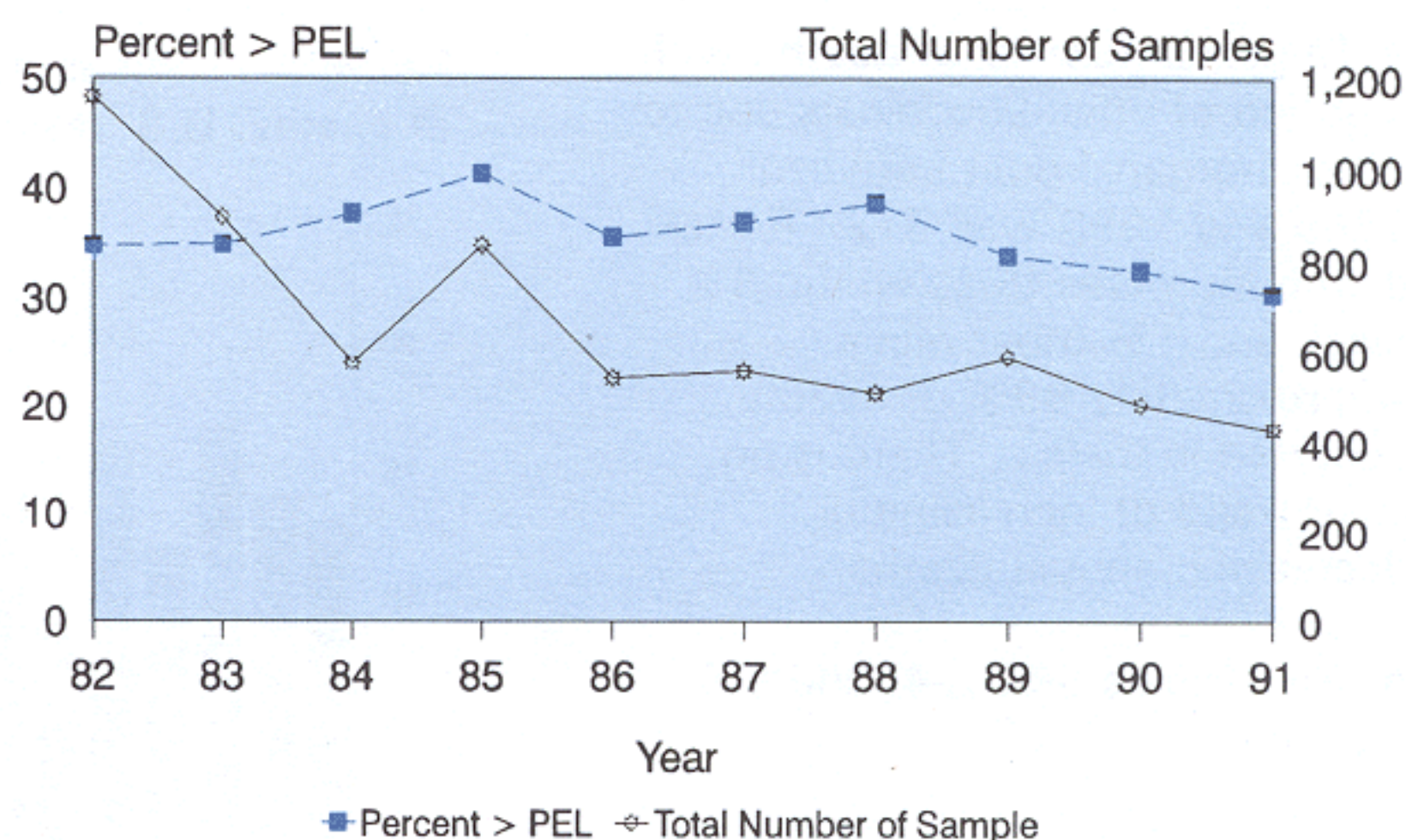
NOTE: MIDAS records the quartz content for those samples which contain more than 1% quartz. Tabulations reported here are based on those data only. At 100% quartz the PEL is 0.098 mg/m<sup>3</sup>. MSHA's metal/nonmetal analytical laboratory changed to a different quartz reference standard on April 1, 1988. See Appendix A for additional information.

SOURCE: Bureau of Mines (BOM), Mine Inspection Data Analysis System (MIDAS).

- The percentage of quartz samples collected by OSHA inspectors above the PEL ranged between 30 and 42%. The total number of samples collected annually declined from a maximum of 1,159 in 1982 to a minimum of 429 in 1991.

- See Table 4-21 for data.

**Figure 4-8. Respirable quartz: number of samples collected by OSHA inspectors and percent above PEL, U.S. general industry, 1982-1991**



**Table 4-21. Respirable quartz: number of samples collected by OSHA inspectors and percent exceeding various levels, U.S. general industry, 1982-1991**

Year	Total number of samples	Samples > PEL	Percent of samples > PEL	Samples > 2x PEL	Percent of samples > 2x PEL	Complaint inspection samples	
						Number	% of total
1982	1,159	402	34.69	175	15.10	108	9.32
1983	897	312	34.78	147	16.39	97	10.81
1984	577	217	37.61	110	19.06	111	19.24
1985	836	345	41.27	183	21.89	211	25.24
1986	544	193	35.48	101	18.57	128	23.53
1987	559	206	36.85	120	21.47	158	28.26
1988	511	197	38.55	99	19.37	202	39.53
1989	590	199	33.73	95	16.10	185	31.36
1990	484	157	32.44	88	18.18	189	39.05
1991	429	130	30.30	78	18.18	153	35.66

NOTE: At 100% quartz, the PEL is 0.098 mg/m<sup>3</sup>.

SOURCE: Occupational Safety and Health Administration (OSHA) Integrated Management Information System (IMIS) data files.