

Trends in Mortality Patterns Among U.S. Coal Miners Filing for Federal Black Lung Program Benefits, 1970 to 2016

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RATIONALE Coal miners suffer excess mortality from non-malignant respiratory diseases (NMRD), including pneumoconioses and chronic obstructive pulmonary disease (COPD). There is limited evidence of excess mortality from lung cancer and ischemic heart disease as well. The U.S. Department of Labor collects data on coal miners applying for Federal Black Lung Program benefits. Mortality data from this population has never been analyzed before and would be the largest study to date of cause of death in U.S. coal miners. **METHODS** We obtained cause of death data from the National Death Index on former U.S. coal miners who previously applied for federal benefits and participated in the National Coal Workers' Health Surveillance Program (CWHSP). We characterized proportional mortality from selected underlying causes of death, employing Chi-square tests and logistic regression to test for significant trends across birth cohort and age group. Causes of death examined were non-malignant respiratory diseases, pneumoconioses excluding asbestosis, COPD, lung cancer, and ischemic heart disease (IHD). **RESULTS** The study population included 34,771 deceased miners who had previously applied for federal benefits between 1970 and 2016 and had participated in the CWHSP. Average age and coal mine employment at time of death was 72 years and 26 years, respectively. NMRD accounted for 20% of the underlying cause of death in this population. Proportional mortality from NMRD increased significantly ($p < 0.05$) among miners aged 65–74 born after 1930 (1930–1939, 28%; 1940–1970, 32%) compared to those born before 1930 (Table 1); a trend observed among deaths from COPD as well. Proportional mortality from NMRD, specifically pneumoconioses, among younger miners (<65 years) increased significantly in the most recent birth cohort compared to earlier birth cohorts. Proportional mortality from lung cancer was significantly elevated among older miners (19%) in the most recent birth cohort (from 1940 onward) compared to miners of the same age in previous cohorts (7–11%). Proportional mortality from IHD decreased significantly over successive birth cohorts. **CONCLUSION** Proportional mortality from NMRD, and specifically pneumoconioses, increased across birth cohorts, with the highest proportions observed in miners born after 1940. This increase is pronounced among younger miners and may reflect increased mortality from progressive massive fibrosis, which is occurring more frequently and in younger U.S. coal miners. The increased proportional mortality from lung cancer in the most recent birth cohort may reflect exposure to workplace carcinogens (e.g., diesel exhaust, respirable silica) for which further analysis is planned.

Table 1. Distribution of and proportional mortality from selected causes of death among 34,771 deceased U.S. coal miners applying for Federal Black Lung Program benefits, 1970 – 2016.

Birth Cohort	N	NMRD ^a		Pneumoconioses ^b		COPD ^c		Lung Cancer ^d		IHD ^e	
		n	%	n	%	n	%	n	%	n	%
1889 – 1919	14,737										
<65	586	59	10.1	28	4.8	24	4.1	76	13.0	198	33.8
65 – 74	4,604	691	15.0	302	6.6	307	6.7	544	11.8	1,392	30.2
≥75	9,547	2,065	21.6	800	8.4	808	8.5	648	6.8	2,272	23.8
1920 – 1929	10,910										
<65	2,581	299	11.6	118	4.6	141	5.5	366	14.2	793	30.7
65 – 74	3,533	653	18.5	295	8.3	293	8.3	576	16.3	852	24.1
≥75	4,796	1,294	27.0	522	10.9	549	11.4	395	8.2	903	18.8
1930 – 1939	4,887										
<65	1,995	222	11.1	75	3.8	120	6.0	326	16.3	538	27.0
65 – 74	1,623	460	28.3	210	12.9	194	12.0	278	17.1	281	17.3
≥75	1,269	425	33.5	171	13.5	190	15.0	145	11.4	170	13.4
1940 – 1970	4,237										
<65	2,990	501	16.8	214	7.2	184	6.2	383	12.8	542	18.1
65 – 74	1,189	375	31.5	150	12.6	159	13.4	172	14.5	145	12.2
≥75	58	19	32.8	*	*	*	*	11	19.0	*	*

* Frequencies <10 are suppressed.

^a Non-malignant respiratory disease (ICD-9 codes 460–519; ICD-10 codes J00–J99)

^b Includes coal workers' pneumoconiosis, silicosis, and pneumoconiosis resulting from exposure to inorganic dusts; excludes asbestosis (ICD-9 codes 500, 502, 503, 505; ICD-10 codes J60–J62, J64)

^c Chronic obstructive pulmonary disease, including emphysema (ICD-9 codes 490–492; ICD-10 codes J43, J44.0, J44.1, J44.8, J44.9)

^d Lung cancer includes ICD-9 code 162; ICD-10 code C34

^e Ischemic heart disease includes ICD-9 code 162; ICD-10 codes I20 – I25

Bold indicates significantly different ($p < .05$) from the proportional mortality observed in the age groups in birth cohort 1889 – 1919, as indicated through logistic regression and Chi-square tests.

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