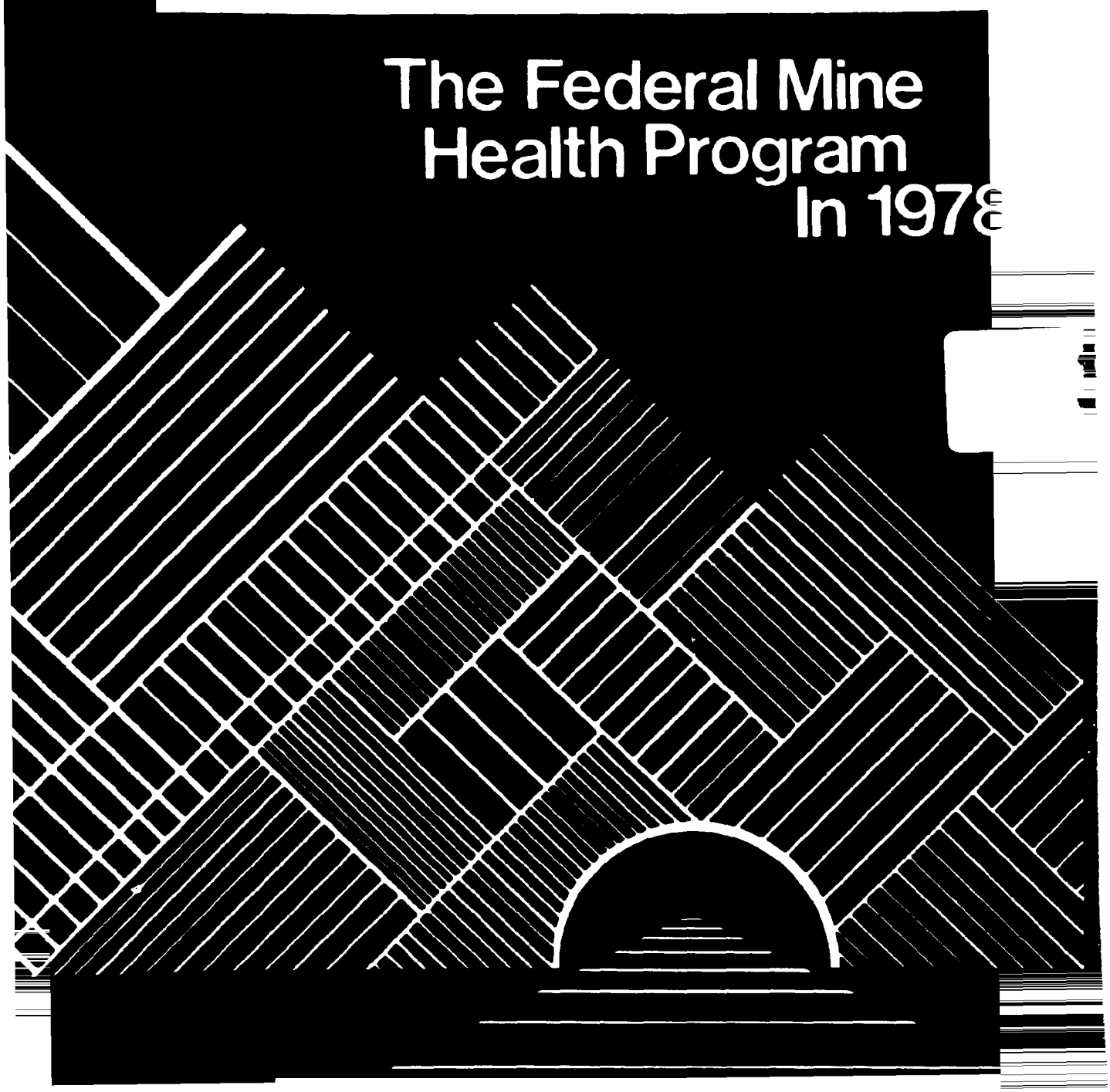
NIOSH

The Federal Mine Health Program In 1978



THE FEDERAL MINE HEALTH PROGRAM IN 1978

ANNUAL REPORT
OF
HEALTH ACTIVITIES
UNDER THE
FEDERAL MINE SAFETY AND HEALTH ACT
OF 1977

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
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EXECUTIVE SUMMARY

Under the Federal Coal Mine Health and Safety Act of 1969, as amended by the Federal Mine Safety and Health Act of 1977, the National Institute for Occupational Safety and Health (NIOSH) is responsible for conducting research to protect the health and safety of America's workers in coal and metal and nonmetal mines.

The 1977 Mining Act led to establishment of two new mining programs during FY 1978. The Mining Industries Surveillance Program is designed to document hazardous physical agents used or found in mines and to evaluate the toxicity of hazardous substances at the concentrations used or found. The Health Hazard Evaluation Program was developed to respond to requests from miners, mine operators, and government agencies regarding possible new health hazards in the mines. This program provides a mechanism for conducting scientific evaluations of special health hazards within 120 days. The results of the evaluations are circulated to related facilities. During FY 1978, six mining health hazard evaluations were initiated.

In FY 1978, standards for coal workers' pneumoconiosis and associated pulmonary disease in coal miners were developed. The standards were presented at the U.S. Department of Labor public hearings on proposed regulations under the Black Lung Benefits Act and will be published and widely distributed to pathologists.

The National Study of Coal Workers' Pneumoconiosis, a large-scale epidemiologic study, was continued with the Third Round. Miners at 8 of the designated mines were examined and examinations on the remaining miners in the more than 30 mines selected will be completed by FY 1980.

From July 27, 1973, to September 30, 1978, NIOSH interpreted X-rays and reported findings to 118,579 miners, of whom 6,682 (5.64%) were told they had findings of category 1, 2, or 3 simple pneumoconiosis or complicated pneumoconiosis and of whom 2,273 (1.92%) were told they were eligible to transfer. During this period, most miners who were examined had worked less than 5 years in coal mining and many examinations were those of new miners, which accounts for the apparent low prevalence of pneumoconiosis.

The Federal Coal Mine Health and Safety Act of 1969 provides for an autopsy of any underground coal miner, regardless of whether he or she was active in coal mining at the time of death. Under the program, 321 autopsies were conducted during FY 1978.

INTRODUCTION

Under the Federal Coal Mine Health and Safety Act of 1969, as amended by the Federal Mine Safety and Health Act of 1977, the National Institute for Occupational Safety and Health (NIOSH) is responsible for conducting research to protect the health and safety of America's workers in coal and metal and nonmetal mines.

NIOSH research takes several forms, including laboratory research and clinical investigations to study how lung function and lung-related diseases are affected by the mine environment. In addition, NIOSH is continuing The National Study of Coal Workers' Pneumoconiosis, a large-scale epidemiologic study.

This report describes these major projects and the findings from other NIOSH mining research activities during fiscal year 1978 (FY 1978).

RESEARCH AND OTHER ACTIVITIES

FEDERAL MINE SAFETY AND HEALTH ACT OF 1977

Mining investigations were given added impetus in FY 1978 with passage of the Federal Mine Safety and Health Act of 1977. Under that Act, NIOSH investigations of mining operations now may cover all mines. Previous NIOSH mining investigations were predominantly related to coal mining. A number of metal and nonmetal mining research projects were initiated in FY 1978.

The 1977 Mining Act led to establishment of two new mining programs during FY 1978. A Health Hazard Evaluation Program was developed to respond to requests from miners, mine operators, and government agencies regarding possible new health hazards in the mines. These requests provide a mechanism for conducting scientific evaluations of special health hazards within 120 days. The results of the evaluations are circulated to related facilities. During FY 1978, six mining health hazard evaluations were initiated.

Another project which grew out of the 1977 Mining Act was the Mining Industries Surveillance Program. The program is designed to document hazardous substances and physical agents used or found in mines and evaluate the toxicity at the concentrations used or found. In FY 1978, the Surveillance staff began soliciting existing information from government agencies, universities, associations, and mining companies. A report on this information will be prepared during FY 1979.

LABORATORY INVESTIGATIONS

Pathologic standards for coal workers' pneumoconiosis (CWP) and associated pulmonary disease in coal miners have been developed. To be published and widely distributed to pathologists, the standards also were presented at the U.S. Department of Labor public hearings on proposed regulations under the Black Lung Benefits Act.

Studies have continued on the elemental composition of fibrosing and nonfibrosing lesions of CWP. The results indicate that it is the ratio of concentrations of silicon to aluminum in the air rather than only the concentration of silicon which is important in fibrogenesis and thus in destructive lung injury.

NIOSH has continued studies seeking evidence of genetic factors in the pulmonary response to coal dust. Inherited determinants of immunoglobulins were studied, but no association with either simple or complicated CWP was found. A high prevalence of autoantibodies in CWP was confirmed, but no evidence was found that these influenced the progression of simple to complicated CWP.

Studies are under way to determine whether magnetometry can be used as a means of mapping coal deposition in the lungs of coal miners. These studies involve comparison of magnetic mapping and conventional mapping of coal dust deposition in freeze-dried autopsy lungs. Preliminary results suggest that the magnetic maps of autopsy lungs are similar to those obtained in living miners.

Studies are continuing on the possible potentiating effects of particulates and particulate-exposed macrophages on fibrogenesis. The particulates undergoing investigation are silica dusts, asbestiform particles, and metals (e.g., aluminum). The emphasis has been on the chemical nature of the fibrous material, since this more accurately reflects metabolic events occurring in pulmonary fibrosis. The ultimate objective is to relate lung pathology seen in both interstitial and nodular fibroses with events taking place at the cellular level. The present study would seem to indicate that in the presence of particulates fibrogenesis proceeds normally, but with qualitative differences in fibrous proteins.

CLINICAL INVESTIGATIONS

Clinical investigations in respiratory diseases involved a number of projects aimed at early detection of disease. In one study, the use of helium-oxygen spirometry in the detection of small airways disease in coal miners was investigated. Simple coal workers' pneumoconiosis is manifest pathologically by dust deposition, reticulin fibrosis, and focal emphysema. Although complex measurements, such as frequency dependence of dynamic compliance, have shown functional changes in the small (less than 2-mm diameter) airways in coal miners, abnormalities in function have been difficult to detect from simpler tests such as air spirometry. NIOSH used helium-oxygen spirometry to study 148 coal miners and 71 asymptomatic nonminer controls to determine whether this technique could detect differences not observed with air spirometry. The results indicate that although helium-oxygen spirometry has theoretical applications in detecting "early" small airway disease, its advantage over conventional air spirometry has yet to be demonstrated. Its use in occupational screening programs cannot be recommended at this time.

NIOSH clinicians also completed a project involving the use of exercise testing in 56 miners and 31 nonminer controls in an effort to detect cardiopulmonary abnormalities which could not be detected while subjects were at rest. Because many of the subjects were older and sedentary, and may have had overt or covert cardiac disease, the levels of exercise used in the testing were submaximal.

The results of the study showed that the miners were older and heavier and had decreased FEV_1/FVC ratios when compared to controls. Exercise data showed that at 1.5 liters/minute of oxygen consumption, the miners had a lower heart rate and minute ventilation. This is attributed to better

cardiac conditioning in the miners, presumably related to increased work exercise compared to controls. A lower tidal volume at a minute ventilation of 30 liters was found in the miners. Although difficult to explain, this may be due to a restrictive effect of their heavier chest walls. No correlation was found between exercise parameters and the spirometry or diffusing capacity data.

NATIONAL STUDY OF COAL WORKERS' PNEUMOCONIOSIS

The major NIOSH study of respiratory health effects of coal mining is the National Study of Coal Workers' Pneumoconiosis, a large-scale epidemiologic study designed to: (1) relate coal workers' pneumoconiosis (CWP) progression to levels of respirable coal mine dust exposure, (2) provide a scientific basis for determining the progression of the disease by use of serial X-rays, and (3) estimate the industrywide prevalence of CWP. NIOSH is presently beginning the Third Round of this study.

During the Third Round of the National Study of Coal Workers' Pneumoconiosis, medical and epidemiological studies will be augmented by an assessment of past and present environmental exposures. This environmental profile for each worker will help in identifying dose/response relationships for coal mine dust.

During FY 1978, miners at eight of the designated mines were examined. Examinations on the remaining miners in the more than 30 mines selected will be completed by FY 1980.

DIESEL STUDIES

As an adjunct to the National Study, NIOSH has examined coal miners exposed to diesel engine exhaust underground. The purpose of this project is to ascertain whether diesel exhaust in combination with coal dust is more hazardous to the miners' health than coal dust alone. The medical fieldwork for this study is complete; the environmental fieldwork was begun in FY 1978 and will be completed in FY 1979.

MORTALITY STUDIES

NIOSH epidemiologists are continuing to conduct mortality studies of coal miners to determine to what extent such factors as occupational history, severity of coal workers' pneumoconiosis, airway obstruction, and chronic bronchitis might influence excess mortality. In the studies, the death rates of coal miners are compared with the expected death rates of average populations of employed males. The usefulness of the standard mortality ratio (SMR), defined as the ratio of the number of observed deaths to the number of expected deaths, depends on the degree to which the biases affecting the death rates are understood. NIOSH has conducted extensive

analyses to determine how factors such as race, standard of living, and smoking habits may affect mortality rates to help determine how the mortality rates of coal miners differ from those of the general population of employed males.

NIOSH is currently studying the mortality experience of three groups of coal miners: (1) a group of 3,726 Appalachian bituminous coal miners who were first examined during 1963-1965, (2) a group of 3,700 applicants for compensation during 1965-1970 under a West Virginia State program of compensation for coal-dust-related disability, and (3) a geographically diverse group of about 12,000 miners of bituminous and anthracite coal who were originally examined during the period 1969-1972. Data collection is under way for all three groups.

CHEST X-RAY EXAMINATIONS OF COAL MINERS

Underground coal miners have been provided chest X-ray examinations since December 30, 1969, as mandated by Section 203 of the Federal Coal Mine Health and Safety Act of 1969, as amended by the Federal Mine Safety and Health Amendments Act of 1977. The X-rays are provided at no cost to the miner and are paid for by the coal mine operators.

Each miner who enters underground coal mining for the first time after December 30, 1969, must receive an initial examination as soon as possible after commencing employment. A second X-ray 3 years later is required and also a third, 2 years thereafter, if the second X-ray shows evidence of the development of pneumoconiosis. New miners who have been given these examinations, as well as miners employed prior to passage of the Act, are to be given the opportunity for examinations at intervals not to exceed 5 years.

The examinations consist of a posterior-anterior chest roentgenogram (X-ray) and an identification document which includes an occupational history. Examinations are given by facilities which are approved by NIOSH and located at a place convenient to the miner. Facilities are approved when they demonstrate their ability to take high-quality X-rays which can be accurately classified for pneumoconiosis.

Physicians who wish to participate in the program as either "A" or "B" readers must demonstrate their proficiency in interpreting X-rays for pneumoconiosis. Physicians who want to become "A" readers must accurately classify six X-rays of varying degrees of pneumoconiosis which they select from their files, or must take a course approved by NIOSH. Physicians wishing to become "B" readers must pass a proficiency examination designed for NIOSH by Johns Hopkins University. The examination tests a physician's ability to classify a chest film for pneumoconiosis via the ILO-U/C 1971 Classification of Radiographs of the Pneumoconioses, to identify other diseases on the radiograph, and to distinguish radiographs of acceptable and unacceptable quality for the proper classification of pneumoconiosis. These trained physician readers ("A" or "B") interpret all chest roentgeno-

grams according to the ILO-U/C Classification of the Pneumoconioses before they are submitted to NIOSH. They also notify the miner's physician of any significant finding.

After NIOSH receives the X-ray and documents, it sends the X-ray to a "B" reader for final interpretation and the miner and his physician are again notified of any significant findings. NIOSH also notifies the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) of the findings of pneumoconiosis, and MSHA notifies the miner of any benefits he or she may be entitled to under the Act.

Under current regulations, any miner whose X-ray shows evidence of category 2 or 3 simple pneumoconiosis is afforded the option to transfer to an area of the coal mine where the dust concentration is less than 1 mg of coal mine dust per cubic meter of air. If such an area does not exist, the miner may transfer to an area where the level of coal mine dust does not exceed 2 mg/m^3. Miners who have X-ray evidence of category 1 are afforded this option if they have worked less than 10 years in coal mining. Miners who choose to exercise their option must contact the Mine Safety and Health Administration of the Department of Labor, which requires the coal mine operator to transfer the miner if he or she is not already working in a safe atmosphere.

Although the X-ray examination program is continuous, it is divided administratively into "rounds." The period beginning August 19, 1970, the date of publication of the regulations governing the examinations, and ending December 30, 1971, is known as the First Round. A Second Round began when the revised regulations became effective on July 27, 1973, and ended on March 31, 1975. The Third Round began on August 1, 1978, and will end on March 31, 1980.

From July 27, 1973, to September 30, 1978, NIOSH interpreted X-rays and reported findings to 118,579 miners (see Table 1) of whom 6,682 (5.64 percent) were told they had findings of category 1, 2, or 3 simple pneumoconiosis or complicated pneumoconiosis and of whom 2,273 (1.92 percent) were told they were eligible to transfer. During this period, most miners who were examined had worked less than 5 years in coal mining and many examinations were those of new miners, which accounts for the apparent low prevalence of pneumoconiosis.

TABLE 1

Roentgenographic Findings of Coal Workers' Pneumoconiosis
Reported to Miners from July 27, 1973, to September 30, 1978

State	ILO-U/C X-Ray Category						Total
	0	1 NT	1 T	2 T	3 T	PMF T	
Alabama	2,251	129	14	17	2	6	2,419
Arkansas	11						11
Colorado	2,634	53	4	21	1	5	2,718
Illinois	6,609	365	80	67	5	17	7,143
Indiana	197	2					199
Iowa	43	5	2	1			51
Kentucky	23,974	764	159	117	8	24	25,046
Maryland	64	3		1			68
New Mexico	15	6		2			23
Ohio	7,951	98	25	14	2	5	8,095
Pennsylvania	17,520	926	165	292	48	94	19,045
Tennessee	554	31	8	4	2	4	603
Utah	2,759	41	3	8			2,811
Virginia	8,779	340	51	53	1	7	9,231
Washington	11	1					12
West Virginia	38,098	1,645	301	491	48	93	40,676
Wyoming	427		1				428
Total	111,897	4,409	813	1,088	117	255	118,579
Percent	94.36	3.72	0.68	0.92	0.10	0.21	100*

NT = Miners not afforded option to transfer
T = Miners afforded option to transfer
* = Totals may not equal 100 because of rounding
PMF = Progressive massive fibrosis

NEW REGULATIONS

On August 1, 1978, NIOSH published two documents in the Federal Register. The first document (43 FR 33713) set forth the rules which revised Part 37 of Title 42, Code of Federal Regulations, entitled "Chest Roentgenographic Examinations." The rules specified, among other things, when and how examinations are made, interpreted, and submitted to NIOSH. Of particular importance is that the Third Round of examinations began on the date of publication. Coal miners will be offered the opportunity for an examination during a 6-month period which will be scheduled on a mine-by-mine basis between August 1, 1978, and March 31, 1980. Coal mine operators have submitted plans for the arrangements of examinations.

The second document (43 FR 33762) set forth proposed changes to the conditions under which underground coal miners are given the option to transfer to another area of the coal mine (Section 37.7 of Part 37 of Title 42, Code of Federal Regulations). The Institute proposed that miners be afforded an opportunity to transfer if their X-ray shows evidence of ILO-U/C classification category 1 (1/1 or 1/2), category 2 (2/1, 2/2, or 2/3), category 3 (3/2, 3/3, or 3/4) simple pneumoconiosis, or complicated pneumoconiosis, regardless of their tenure in coal mining. Presently, miners are afforded a transfer option if their X-ray shows category 2 or 3 simple pneumoconiosis, complicated pneumoconiosis, or category 1 simple pneumoconiosis if the miner worked less than 10 years in coal mining. Comments have been received and information was submitted by interested parties in an open hearing conducted by NIOSH on September 15, 1978.

AUTOPSY SERVICE

The Federal Coal Mine Health and Safety Act of 1969 provides for an autopsy of any underground coal miner, regardless of whether he or she was active in coal mining at the time of death. Pathologists are reimbursed up to $200 for their service if they submit the forms and tissue specimens required by the subpart of Part 37 of Title 42, Code of Federal Regulations, entitled "Autopsies of Coal Miners." Under the program, 321 autopsies were conducted from October 1, 1977, to September 30, 1978.

CONCLUSION

Since 1969, NIOSH has been conducting research to protect the health and safety of America's coal miners. As the energy crisis worsens and coal utilization increases, NIOSH will have increasing responsibility for protecting the health and safety of miners, including the many new workers entering the mining industry. NIOSH is prepared for this important role by continuing its work in laboratory studies of the causes and prevention of coal-related diseases, monitoring the health of coal miners through its National Study and X-ray examination program, and providing health hazard evaluations at coal and other mines to assure that mines, like any other workplace, are free from any substance or physical agent that has potentially hazardous effects on the worker.

APPENDIX A

COAL MINE HEALTH RESEARCH GRANTS
ACTIVE IN FY 1978

GRANT NUMBER	NAME, INSTITUTION, AND PROJECT TITLE	AMOUNT
5R01OH00356-07	Robert T. Christian, University of Cincinnati, "Cellular Response to Coal Dust in Vitro (CWP)."	$79,354
2R01OH00565-03	Franklin D. Schowengerdt, Colorado School of Mines, "Nucleation Properties of Respirable Coal Dust."	$56,361

APPENDIX B

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