

ANTHRACOSILICOSIS AND COMMONWEALTH EXPENDITURES
UNDER THE
OCCUPATIONAL DISEASE LAW



A Report
of the
JOINT STATE GOVERNMENT COMMISSION

1959



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UNDER THE
OCCUPATIONAL DISEASE LAW



General Assembly of the Commonwealth of Pennsylvania
JOINT STATE GOVERNMENT COMMISSION
Harrisburg, Pennsylvania
1959

The Joint State Government Commission was created by Act of 1937, July 1, P. L. 2460, as amended 1939, June 26, P. L. 1084; 1943, March 8, P. L. 13; 1956, May 15, P. L. (1955) 1605, as a continuing agency for the development of facts and recommendations on all phases of government for the use of the General Assembly.

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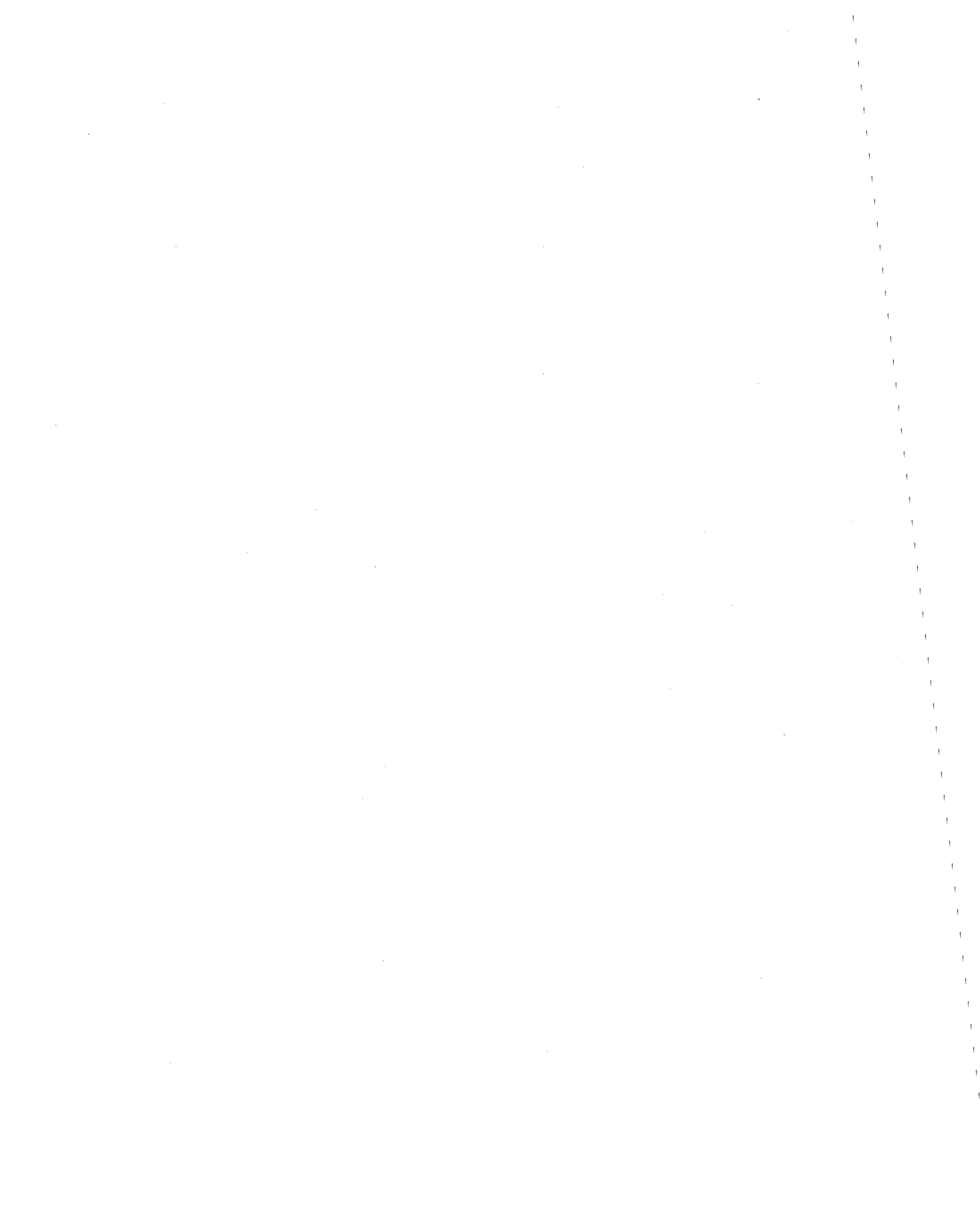


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INTRODUCTION

In view of the expected 40-fold increase in Commonwealth expenditures for occupational disease compensation payments over the last five biennia, the Executive Committee of the Joint State Government Commission initiated a study contemplating a thorough review of the operation of the occupational disease law.

A task force was duly appointed to undertake the study. To facilitate the work of the task force the Executive Committee appointed a committee of conferees consisting of representatives of miners, mine operators and insurers, and a medical specialist.

The task force examined the changes in the case load and associated Commonwealth expenditures, and the factors responsible for these changes.

The present report presents the major factual findings of the task force.

The Joint State Government Commission acknowledges the cooperation of the staff of the Department of Labor and Industry, Bureau of Workmen's Compensation and Bureau of Employment Security, who furnished statistical data in connection with the study.

BAKER ROYER, *Chairman*

*Joint State Government Commission
Capitol Building
Harrisburg, Pennsylvania
March, 1959*

Section I

PAST AND PRESENT CASE LOAD AND COST

Over the period June 1, 1947, to November 11, 1958, the number of total disability and death benefit cases under the occupational disease law increased from 678 to 5,259 (Table 1). Commonwealth expenditures for claims rose from \$541,908 for the biennium 1947-1949, to \$8,100,000 for the biennium 1955-1957, and to \$14,492,078 for the first *seventeen* months of the biennium 1957-1959.

Examination of the composition of the case load as of September 25, 1958, showed that silicosis accounted for 99.8 percent of the load; anthracosilicosis alone, for 93.4 percent. In 92 percent of the cases, the Commonwealth carried 100 percent liability; in the remaining 8 percent, financial responsibility was divided between the Commonwealth and employers.

Table 1
NUMBER OF TOTAL DISABILITY AND DEATH CASES
UNDER THE OCCUPATIONAL DISEASE LAW
COMMONWEALTH EXPENDITURES AND APPROPRIATIONS
BIENNIA 1947-1949 TO 1957-1959

<i>Biennium</i>	<i>Number of Cases as of Beginning of Biennium</i> ¹	<i>Commonwealth Award Payments During Biennium</i> ²	<i>Appropriations Including Deficiency Appropriations</i>
(1)	(2)	(3)	(4)
1947-1949	678	\$ 541,908	\$ 750,000
1949-1951	1,146	598,629	1,150,000
1951-1953	1,521	1,450,000	1,650,000
1953-1955	1,364	1,025,000	1,025,000
1955-1957	1,459	8,100,000	8,100,000
1957-1959	3,251	14,492,078 ^a	13,000,000
November, 1958	5,259 ^a		

¹ The number of cases shown in column (2) is the number of active cases on the last payroll in May, including recipients who received their first checks on that date.

² Total Commonwealth expenditures for occupational disease claims exclusive of administrative expenses.

^a As of November 11, 1958.

SOURCES: Columns (2) and (3): Pennsylvania Department of Labor and Industry, Bureau of Workmen's Compensation; column (4); Appropriations Acts, Sessions of 1947-1949 through 1957-1959.

Table 2

BIWEEKLY CASE LOAD AND BIWEEKLY COMMONWEALTH EXPENDITURES, EXCLUSIVE OF ADMINISTRATIVE EXPENSES, UNDER THE OCCUPATIONAL DISEASE LAW FOR TOTAL DISABILITY AND DEATH CLAIMS IN THE ANTHRACITE REGION AND IN THE REST OF PENNSYLVANIA, AS OF SEPTEMBER 25, 1958

County or Area	Case Load		Commonwealth Expenditures	
	Number ¹	Percent of Total	Amount	Percent of Total
(1)	(2)	(3)	(4)	(5)
Carbon	285	5.5%	\$ 18,141	5.8%
Columbia	18	.3	1,140	.4
Lackawanna	487	9.4	30,574	9.8
Luzerne	2,796	54.0	174,219	55.9
Northumberland	152	2.9	9,333	3.0
Schuylkill	897	17.3	54,806	17.6
<i>Anthracite Region—Total</i>	4,635	89.5%	\$288,213	92.5%
<i>Rest of Pennsylvania</i>	541	10.5	23,328	7.5
Pennsylvania Total	5,176	100.0%	\$311,541	100.0%

¹ The number of cases shown in column (2) is the number of active cases as of September 25, 1958, including recipients who received their first checks on that date.

SOURCE: Pennsylvania Department of Labor and Industry, Bureau of Workmen's Compensation.

In the fall of 1958, about 90 percent of total biweekly case load and 93 percent of total biweekly expenditures were concentrated in the anthracite-producing counties of Carbon, Columbia, Lackawanna, Luzerne, Northumberland and Schuylkill, hereafter referred to as "the anthracite region"¹ (Table 2). Luzerne County accounted for 54 percent of the total biweekly

number of cases and 56 percent of the total biweekly Commonwealth cost. The evidence suggests that the geographic distribution of case load has been relatively stable in the recent past.

¹ The counties included in the anthracite region accounted for 99 percent of total anthracite production in 1956, and each of these counties produced in excess of 800,000 tons during that year.

Section II

ECONOMIC CHARACTERISTICS OF THE ANTHRACITE REGION

A. ANTHRACITE AND ITS COMPETITORS

Between 1900 and 1956, total energy production in the United States increased 500 percent, whereas anthracite production decreased more than 50 percent.

Specifically, production of anthracite coal, in terms of British Thermal Units (B.T.U.'s), decreased from 1,457 trillion B.T.U.'s in 1900 to 726 trillion B.T.U.'s in 1956, although total energy production rose from 7,893 trillion B.T.U.'s to 41,210 trillion B.T.U.'s (Chart I).

Anthracite production decreased from 18.4 percent of total energy production in 1900 to but 1.8 percent in 1956. In contrast, the relative share in total energy production of the competitive fuels, petroleum and natural wet gas, increased from 7.9 to 62.7 percent.

B. ANTHRACITE MARKETS

In view of the decline in the use and production of anthracite, it is informative to examine the changes, absolute and relative, in the size of the major anthracite markets (Table 3).

Table 3
CONSUMPTION OF ANTHRACITE COAL BY MAJOR MARKETS
1946 AND 1957

<i>Market</i>	1946		1957	
	<i>Net Short Tons in Thousands</i> ¹	<i>Percent</i>	<i>Net Short Tons in Thousands</i> ¹	<i>Percent</i>
(1)	(2)	(3)	(4)	(5)
Space Heating ²	46,100	76.2%	16,200	64.6%
Industrial (Utilities, Railroads, Briquette Manufacturers, Coking Industry)	5,900	9.8	4,300	17.1
Exports	6,500	10.7	4,300	17.1
Collieries	2,000	3.3	300	1.2
Total Consumption and Exports	60,500	100.0%	25,100	100.0%

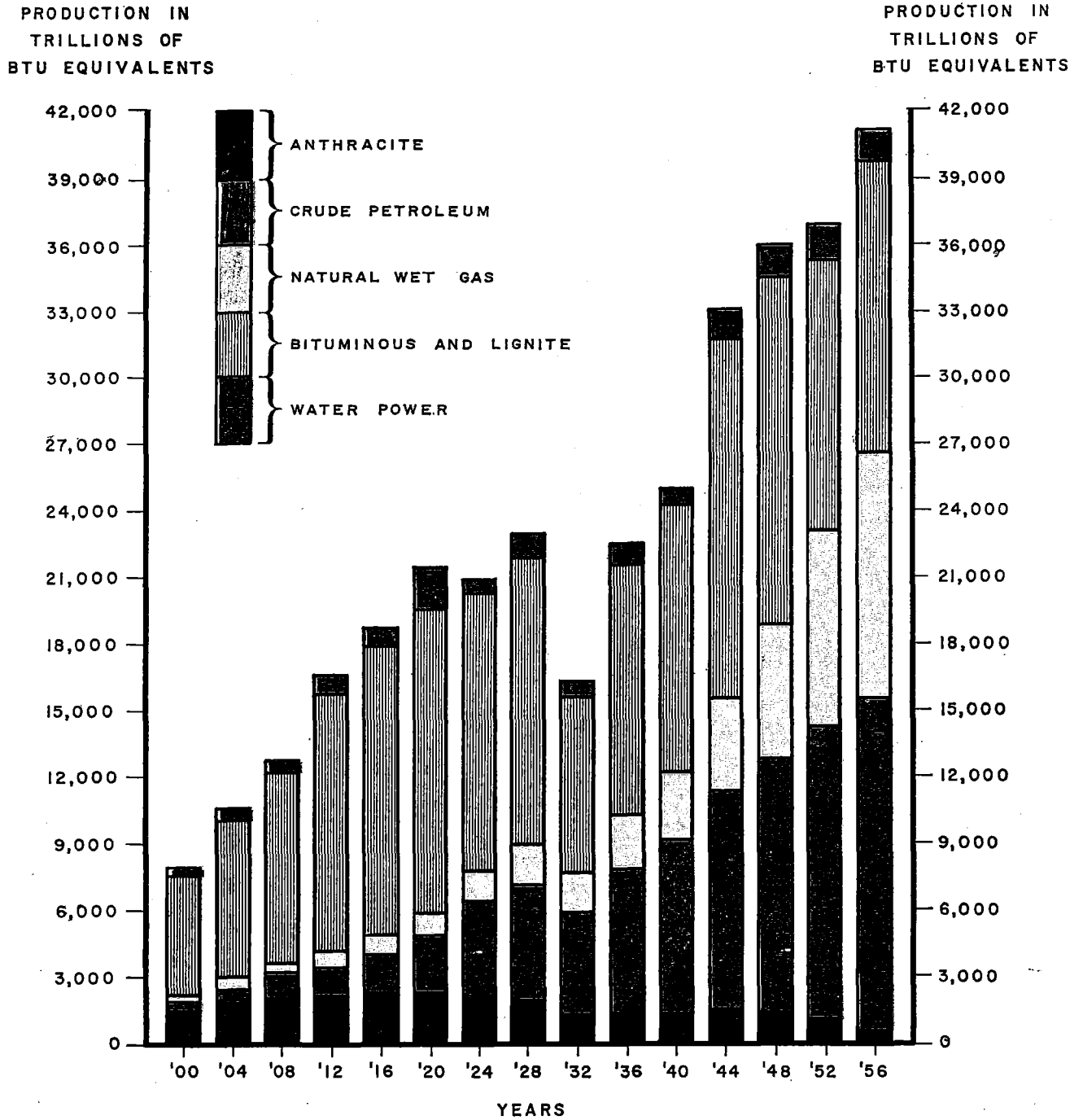
¹ Data rounded.

² Estimated. For details of estimating procedure see Note 2, Appendix Table A-4.

Note: For detail, see Appendix Table A-4.

SOURCE: Adapted from data published in *Minerals Yearbook*, 1946, 1957, United States Bureau of Mines.

Chart I
**ANNUAL PRODUCTION OF MINERAL FUELS AND WATERPOWER IN THE
 UNITED STATES
 1900-1956**



Note: For details see Appendix Tables A-2 and A-3.

SOURCE: Adapted from data published in: Committee on Interior and Insular Affairs, *Findings and Recommendations of the Special Subcommittee on Coal Research*, Union Calendar No. 490, 85th Congress, House of Representatives Report No. 1263, 1957.

In *absolute* terms, each of the principal markets showed significant decline during the period 1946 to 1957. Anthracite in the United States has been used principally as a space-heating fuel (home and business), and as an industrial fuel. However, substitution of oil and gas for home and business space heating has adversely affected the space-heating market. The decrease in anthracite consumption by railroads is largely attributable to the substitution of diesel for steam engines, and to the decreased utilization of railroads as a means of transportation. Foreign markets for anthracite, like the major United States markets, have fallen off since World War II.

As regards changes in *relative* importance of major markets, it should be noted that by 1957 space heating had decreased from 76.2 to 64.6 percent of total anthracite consumption; industrial use increased from 9.8 to 17.1 percent, and exports to foreign countries from 10.7 to 17.1 percent.

In view of the over-all shrinkage of all major markets, *including* industrial anthracite consumption, the areas of expansion in anthracite use are of strategic importance. Anthracite's use in coke production grew from 238,812 net tons in 1946 to 389,000 net tons in 1957; between 1954 and 1957, consumption of anthracite by sintering plants rose from a negligible amount to an estimated 885,000 net tons. In addition, the steel industry is experimenting with the substitution of anthracite for coke. Some explorations have been undertaken in the conversion of anthracite to fuel gas.

At present, however, the quantity of anthracite absorbed by markets which have shown expansion is relatively small, and future behavior of both declining and expanding markets is a matter

of conjecture. In passing, it should be pointed out that wider fluctuations in hard coal output may follow from an increasing dependence upon industrial markets, such as the steel industry, which are subject to relatively wide variations in production.

C. ANTHRACITE PRODUCTION AND EMPLOYMENT

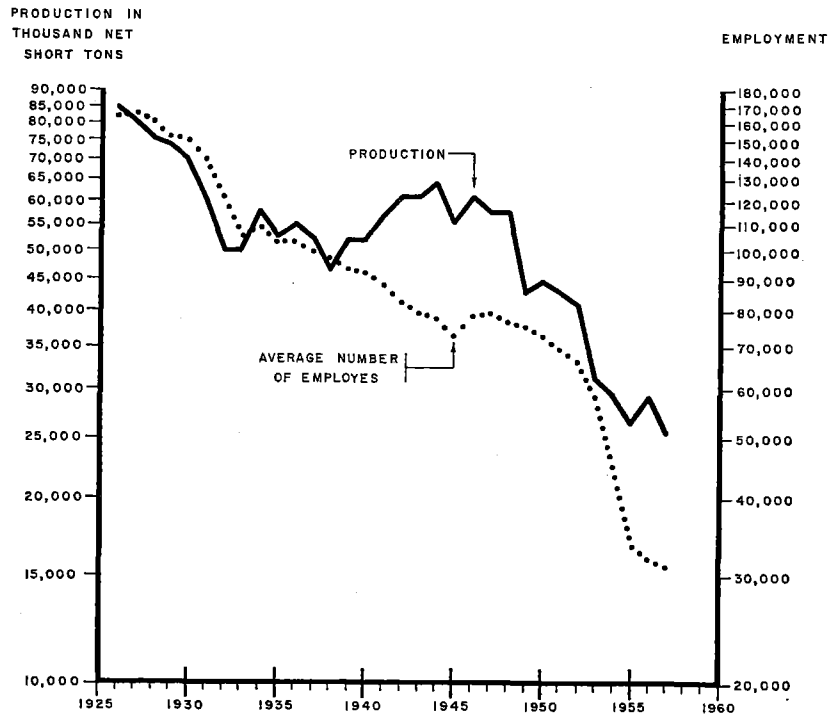
The decline in the markets for anthracite has affected both production and employment in the anthracite industry.

Examination of Chart II shows:

1. In the period 1926 (highest post-World War I employment year) to 1957, anthracite production declined from approximately 84,400,000 to 25,300,000 net short tons; average annual employment decreased from 165,400 to 30,800.
2. Declines in production and employment showed marked variations over the period under review. For example, between 1926 and 1938, decreases in the average number of employes sometimes preceded and sometimes followed decreases in production; however, since 1938, employment has, generally, declined more rapidly than production.
3. During the period 1938 to 1944, the short-lived increase in production was associated with a virtually constant decrease in the average number of employes. Specifically, during this short period, production *increased* from 46,100,000 tons to 63,700,000 tons, but employment *decreased* from 96,400 to 77,600.

The more rapid decline in employment than in production for the period 1938 to 1957 can be largely explained by reference to changes in hours and days worked and to the relative in-

Chart II
 ANNUAL ANTHRACITE PRODUCTION AND AVERAGE ANNUAL
 EMPLOYMENT IN THE ANTHRACITE INDUSTRY
 1926-1957



Note: For details see Appendix Table A-5.

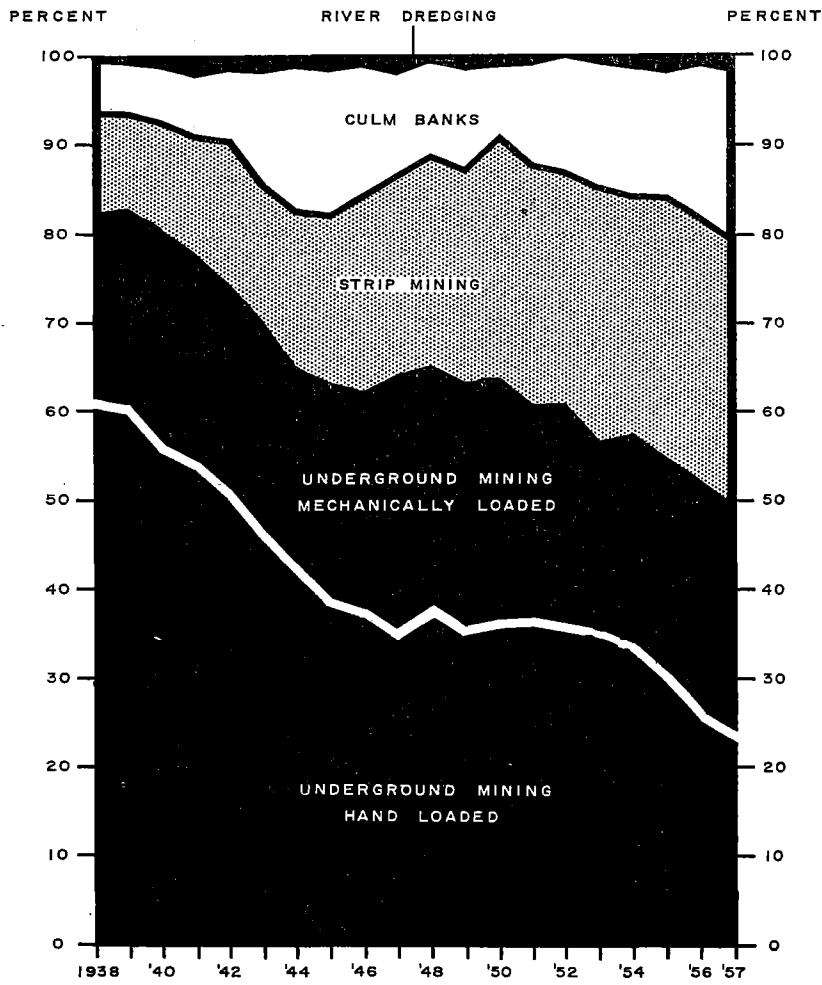
SOURCE: Adapted from data published in *Minerals Yearbook, 1957*, United States Bureau of Mines.

crease in mechanically loaded tonnage in underground mines and the expansion of strip mining operations and culm bank exploitation (Chart III).

The chart shows that, for the period 1938 to 1957, the percentage of anthracite production attributable to underground mining decreased from 82.7 to 49.8 percent. The proportion of

coal which was hand loaded underground fell from 60.7 percent of total production to 23.5 percent, while underground mechanical loading increased from 22.0 to 26.3 percent. Over the same period, the relative output attributable to strip mining increased from 11.0 to 29.8 percent; and that attributable to culm bank mining, from 5.1 to 17.8 percent.

Chart III
 PERCENTAGES OF TOTAL ANTHRACITE PRODUCTION
 ATTRIBUTABLE TO DIFFERENT MINING METHODS
 1938-1957



Note: For details see Appendix Table A-6.

SOURCE: Adapted from data published in *Minerals Yearbook, 1938-1957*, United States Bureau of Mines.

D. ALTERNATIVE EMPLOYMENT OPPORTUNITIES

Industries can be classified broadly as "product" industries (i.e., manufacturing, farming, mining) and "non-product" industries (i.e., contract construction, transportation, communication, finance, insurance and real estate, and services).

It is widely agreed that employment offered by "non-product" industries depends, in large part, upon economic conditions in "product" industries. Of the "product" industries in the anthracite region offering alternative employment to mining, farming has been economically inconsequential. Therefore, it becomes pertinent to investigate the development of manufacturing that took place concurrently with the decrease in anthracite production. Chart IV traces the region's employment in mining and manufacturing for the years 1930, 1940, 1950 and 1957.

In 1930, approximately 158,000 persons in the anthracite region were employed in mining and about 89,000 in manufacturing. By 1940, employment in mining had dropped to 89,000, and in manufacturing, to approximately 66,000. In other words, decreases in mining employment between 1930 and 1940 were *not* compensated for by increases in manufacturing employment.

By 1950, the number of employes in mining had decreased to 75,000, while manufacturing employment had increased to 112,000. In the 1940's, decreases in mining jobs were more than offset by increases in employment opportunities in manufacturing.

However, this encouraging development did not continue through subsequent years. Between 1950 and 1957, mining employment further declined from 75,000 to an approximate 30,000, a decline offset only in small measure by an increase to 122,000 in the number of manufacturing employes.

For a detailed view of employment changes during the period 1951-1957, Table 4 presents data in terms of the number of gainfully employed in anthracite region industries covered by unemployment compensation, and the net changes.² Employment in the anthracite mines decreased by 40,167, while employment in manufacturing increased by only 37. Furthermore, employment in industries other than mining and manufacturing decreased by 6,997.

In passing, it should be noted that textile mills in the anthracite region, which provided 9,596 fewer jobs in 1957 than in 1951, appear to be following the national pattern of North-South migration.

E. INDUSTRIAL PRODUCTIVITY

Although changes in the number of men and women who are offered employment by industry in a given region are indicative of changes in economic conditions, a measure of economic potential is furnished by what is commonly known as "value added per employe."

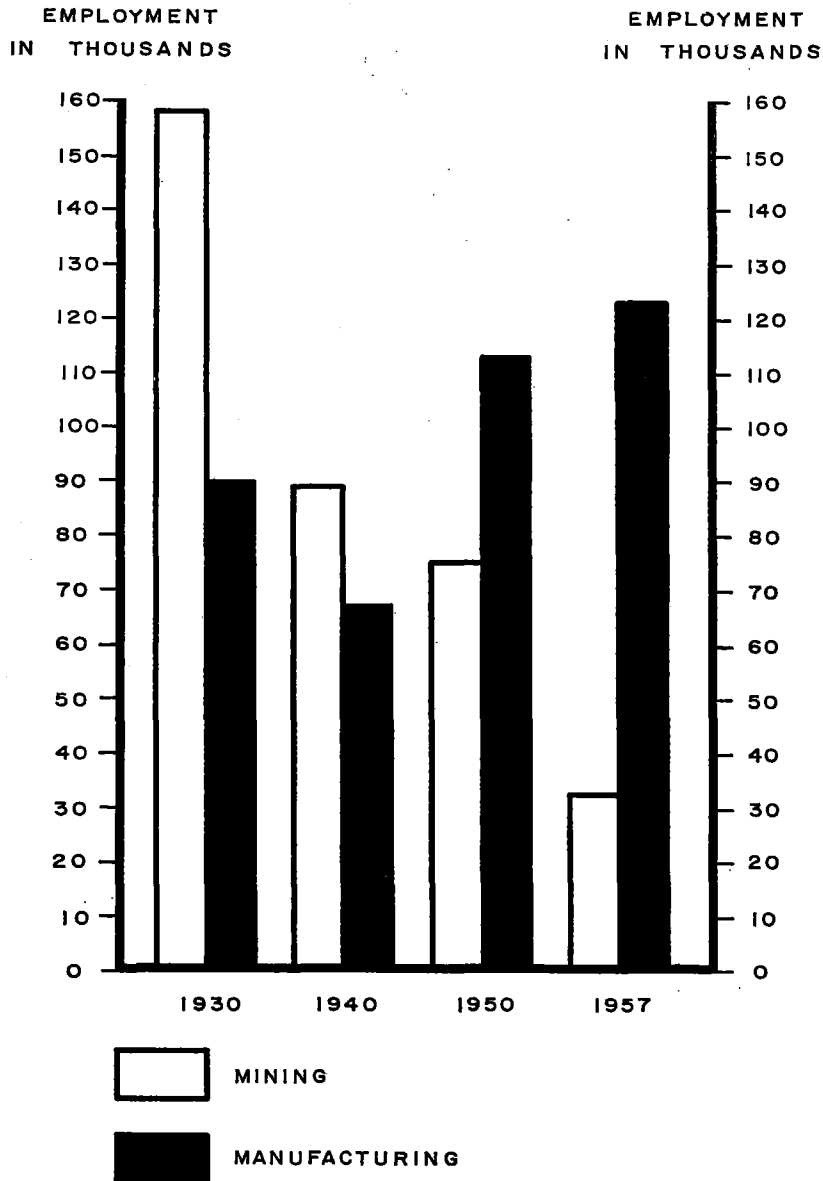
Briefly, "value added" by an industry equals the value of total sales, minus the cost of purchases.³ In other words, it represents the margin available for wage payments and returns to capital. Generally speaking, the greater the value added per worker, the higher the wage, and the greater the productivity of the given industry.

² It should be observed that the figures presented in Table 4 and those underlying Chart IV for 1930, 1940 and 1950 are not, strictly speaking, comparable. For details, see Appendix Table A-7. In addition, 1950 data still reflect the impact of the recession of 1949.

³ Value added by manufacture equals value of shipments by manufacturing establishments, less cost of materials, supplies and containers, fuel purchased, electrical energy, and contract work.

Chart IV

EMPLOYMENT IN MINING AND MANUFACTURING IN THE ANTHRACITE REGION—APRIL 1, 1930, 1940 AND 1950, AND MARCH 15, 1957



Note: For details see Appendix Table A-7.

SOURCES: Adapted from data published in *Census of the United States, 1930, 1940, and 1950*; *Statistical Information Bulletin No. 123*, Pennsylvania Department of Labor and Industry, Bureau of Employment Security.

Table 4
EMPLOYMENT IN THE ANTHRACITE REGION BY INDUSTRY
1951 AND 1957

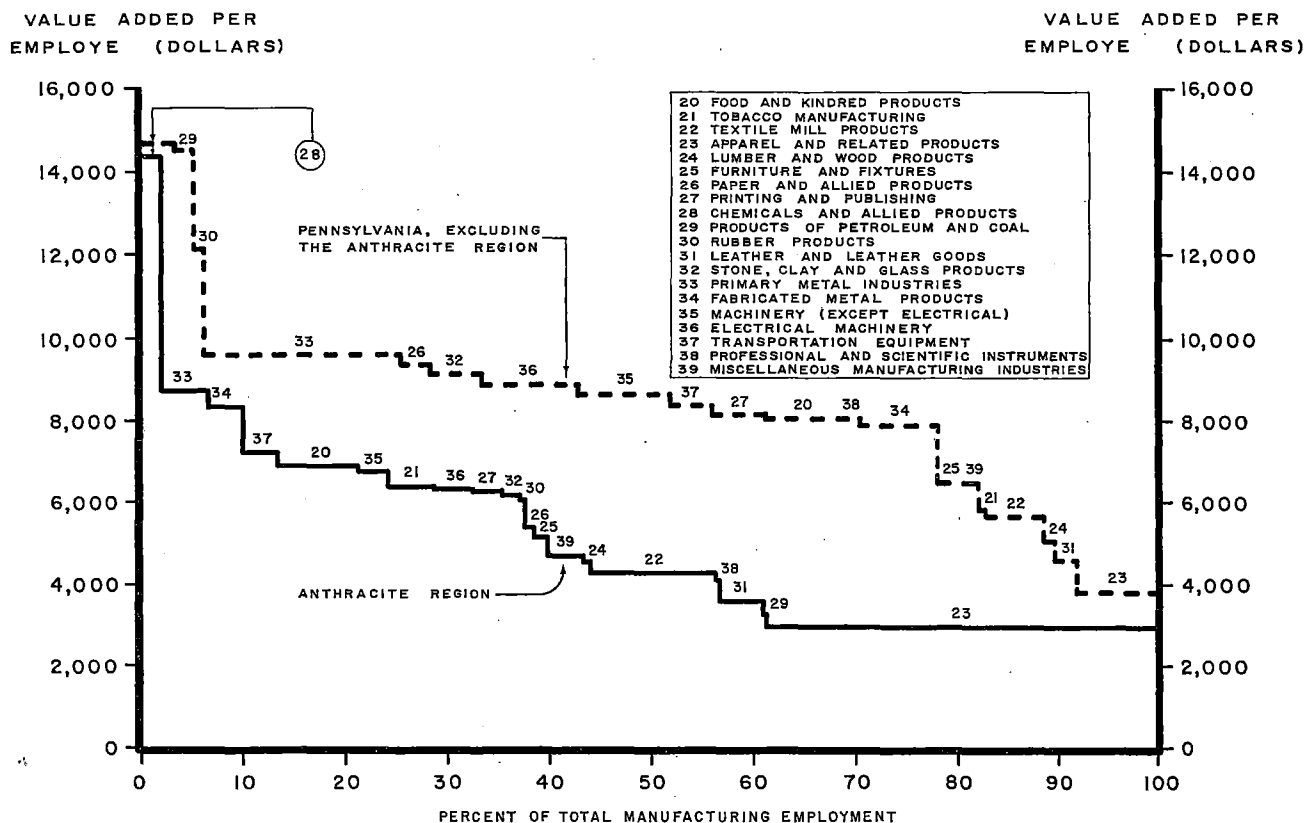
<i>Industry</i>	<i>Number of Employees</i>		
	1951	1957	<i>Net Change 1951-1957</i>
(1)	(2)	(3)	(4)
Anthracite Mining	70,146	29,979	-40,167
Manufacturing	122,329	122,366	+ 37
Ordnance and accessories	192	3,685	+ 3,493
Food and kindred products	8,117	7,548	- 569
Tobacco manufacturing	5,066	5,542	+ 476
Textile mill products	24,224	14,628	- 9,596
Apparel and related products	43,252	46,852	+ 3,600
Lumber and wood products	1,634	1,025	- 609
Furniture and fixtures	2,612	1,948	- 664
Paper and allied products	714	767	+ 53
Printing and publishing	3,867	4,601	+ 734
Chemicals and allied products	2,236	3,060	+ 824
Products of petroleum and coal	74	97	+ 23
Rubber products	2	62	+ 60
Leather and leather goods	3,669	5,712	+ 2,043
Stone, clay, and glass products	917	999	+ 82
Primary metal industries	6,985	5,778	- 1,207
Fabricated metal products	4,237	4,330	+ 93
Machinery (except electrical)	3,018	3,591	+ 573
Electrical machinery	3,984	4,311	+ 327
Transportation equipment	5,779	4,889	- 890
Professional and scientific instruments	62	382	+ 320
Miscellaneous manufacturing industries	1,688	2,559	+ 871
Contract construction	8,941	7,325	- 1,616
Transportation and communication	14,645	14,706	+ 61
Wholesale and retail trade	55,151	51,424	- 3,727
Finance, insurance, and real estate	6,712	7,473	+ 761
Service industries	18,253	15,813	- 2,440
Miscellaneous industries	188	152	- 36

Note: Employment in terms of workers covered by State unemployment compensation laws for the pay period nearest the fifteenth of March.

SOURCE: *Statistical Information Bulletin* No. 123, Pennsylvania Department of Labor and Industry, Bureau of Employment Security, and additional unpublished data furnished to the Joint State Government Commission by the Bureau.

Chart V

PERCENTAGE DISTRIBUTION OF MANUFACTURING EMPLOYEES IN THE ANTHRACITE REGION AND IN THE REST OF PENNSYLVANIA, BY VALUE ADDED PER EMPLOYEE IN INDUSTRY OF EMPLOYMENT
1956



Note: For details see Appendix Table A-8.

SOURCE: Adapted from data published in 1956 *Industrial Census of Pennsylvania*, Pennsylvania Department of Internal Affairs.

Chart V shows for the anthracite region (solid line) and for the rest of Pennsylvania (dotted line), as of 1956, relative employment (horizontal scale) in manufacturing industries characterized by varying levels of value added per employee (vertical scale). The industries are ordered on the basis of value added per employee.

The chart should be read as follows: The chemical industry *in the anthracite region* (number 28 on the solid line) produced a value added per employee of \$14,390 (vertical scale) and employed about 2 percent (horizontal scale) of manufacturing workers in the region; similarly, *in Pennsylvania, exclusive of the anthracite region,*

the chemical industry (number 28 on the dotted line) produced a value added per employe of \$14,660 and employed about 3 percent of the manufacturing workers.

Turning from the highest productivity industry (chemicals) to the lowest productivity industry (apparel), it should be noted that, in the anthracite region, 39 percent of all manufacturing employes were working in the apparel industry, which had a value added per employe of \$2,970. In the rest of Pennsylvania, the apparel industry had a value added per employe of \$3,800 and accounted for 8 percent of total employment.

As indicated by the chart, 50 percent of the gainfully employed in manufacturing in the an-

thracite region were employed by industries producing a value added per employe of \$4,230 or less. In the rest of Pennsylvania, 50 percent of the gainfully employed in manufacturing were employed by industries producing a value added per employe of \$8,670 or less.

The chart permits the following generalizations:

1. The average value added per employe within each manufacturing industry group (except tobacco) was *lower* in the anthracite region than in the rest of the Commonwealth.⁴ On

⁴ Value added per employe for a manufacturing industry group does not necessarily reflect the productivity of any single establishment within the group.

Table 5
POPULATION AND POPULATION CHANGES IN PENNSYLVANIA,
ANTHRACITE REGION, AND REST OF THE STATE
SELECTED YEARS 1930-1957

Year	Anthracite Region		Rest of Pennsylvania		Total Pennsylvania
	Total	Percent of Pennsylvania	Total	Percent of Pennsylvania	
(1)	(2)	(3)	(4)	(5)	(6)
1930	1,231,698	12.8%	8,399,652	87.2%	9,631,350
1940	1,211,127	12.2	8,689,053	87.8	9,900,180
1950	1,078,347	10.3	9,419,665	89.7	10,498,012
1957 ^a	1,008,788	9.1	10,034,209	90.9	11,042,997
1930-1957 Population Change					
Number	— 222,910		+ 1,634,557		+ 1,411,647
Percent	— 18.1%		+ 19.5%		+ 14.7%
1950-1957 Population Change					
Number	— 69,559		+ 614,544		+ 544,985
Percent	— 6.5%		+ 6.5%		+ 5.2%

^a Estimate by Pennsylvania State Planning Board.

SOURCES: *Census of the United States*, 1930, 1940, and 1950; Pennsylvania State Planning Board data.

the average, value added per employe for all manufacturing was \$5,010 in the anthracite region, and \$8,270 in the rest of Pennsylvania.

2. A larger proportion of total manufacturing employment was concentrated in low productivity industry groups in the anthracite region than in the rest of the Commonwealth.

Apparel and leather, the industries in the anthracite region showing the greatest increases in employment (exclusive of ordnance) during the period 1951-1957 (Table 4), had, in 1956, a value added per employe of \$2,970 and \$3,580 respectively.

As regards the relative productivity of mining and manufacturing, it should be noted that, in

1956, the value added per employe in mining was \$4,940, and in manufacturing, \$5,010.

F. POPULATION AND ECONOMIC OPPORTUNITY

Absolute and relative declines in the economic position of the anthracite region explain, in large part, the population decline which has taken place since 1930.

From 1930 to 1957, population of the anthracite region declined by 18.1 percent, while that of the rest of the state increased by 19.5 percent (Table 5). During the period 1950 to 1957, the area's population decreased by 6.5 percent; the rest of the state showed an increase of 6.5 percent. As a result of these relative changes, the population of the anthracite region, as a proportion of total Pennsylvania population, decreased from 12.8 percent in 1930 to 10.3 percent in 1950 and to 9.1 percent in 1957.



Section III

THE OCCUPATIONAL DISEASE LAW: BACKGROUND AND CHANGES

A. PURPOSE OF WORKMEN'S COMPENSATION LAWS

Pennsylvania's first workmen's compensation statute was passed in 1915.¹

This enactment followed the direction of studies by the 1911² and 1913³ Sessions of the General Assembly, and became operative only after the adoption of a constitutional amendment. The amendment, approved November 2, 1915, added the following to Article III, Section 21:

"The General Assembly may enact laws requiring the payment by employers, or employers and employes jointly, of reasonable compensation for injuries to employes arising in the course of their employment, and for occupational diseases of employes, whether or not such injuries or diseases result in death, and regardless of fault of employer or employe, and fixing the basis of ascertainment of such compensation and the maximum and minimum limits thereof, and providing special or general remedies for the collection thereof; . . ."

Briefly, the purpose of the Pennsylvania statute, like that of comparable statutes in other states, was to provide wage earners with a measure of compensation for job-connected injuries resulting from industrial accidents.

Although prior to the enactment of workmen's compensation statutes the injured wage earner

had recourse to common law remedies, such defenses as the fellow-servant doctrine, assumption of risk, and contributory negligence made recovery exceedingly difficult, if not impossible.

The sum and substance of the workmen's compensation statute involved a voluntary relinquishment on the part of both employers and employes of common law rights and remedies, and the substitution of a contractual relationship between employers and employes which provided for schedules of payments for statutorily defined industrial injuries. The burden of financing these payments was placed upon employers. It was argued at the time that employers, in an effort to maintain their competitive position, would strive to minimize their costs by the installation of safety devices. As regards the incidence of the costs of workmen's compensation, however, it has been stated that ". . . the consumer of a particular product ultimately pays the cost of compensation protection for the workers engaged in its manufacture . . ." ⁴

It should be noted that The Pennsylvania Workmen's Compensation Act of 1915, as well as most of the comparable acts of other states, originally contemplated compensation for occupational injuries only. What have come to be

¹ 1915, June 2, P. L. 736.

² 1911, June 14, P. L. 917.

³ 1913, June 27, P. L. 650.

⁴ Arthur Larson, *The Law of Workmen's Compensation*, Volume I, Section 3.20 (New York: Matthew Bender & Company, Incorporated, 1952), Page 17.

known as occupational diseases, such as disability incurred by virtue of exposure to poisonous or injurious substances prevalent at the place of employment, were not covered by the original act.

In 1932, a commission of ten members was appointed by Governor Pinchot to conduct a study of occupational disease hazards within the Commonwealth. The recommendations of the commission, known as The Pennsylvania Commission on Compensation for Industrial Disease, were presented by the Governor to the General Assembly at the 1933 Session.

In the light of the contemporary importance of anthracosilicosis as an occupational disease, it may be noted that the commission of 1932 observed in its report (Appendix to the Legislative Journal, Session of 1933, Volume VI, *Occupational Disease Compensation Report* by The Pennsylvania Commission on Compensation for Industrial Disease, pages 7365 to 7394):

"7. Your Commission is of the opinion that the diseases which will be of major importance and which will present the greatest difficulties as administrative problems, are silicosis and/or miners' asthma, and further believes that any act which includes them as compensable diseases must contain special provisions outlining the course of procedure to be followed in determining in a given case whether or not a claimant is entitled to compensation, and which employer or employers shall be held liable therefor."

The commission further observed:

"11. The Commission, appreciating the lack of sufficient information as to the exact nature and prevalence of chronic incapacitating miners' asthma, unanimously recommends that a survey be made by the U. S. Bureau of Public Health Service with the cooperation of the employers and employes in the anthracite coal regions."

Subsequent to the commission's report, the Pennsylvania Department of Health, in collaboration with the United States Public Health Service, made a study of the incidence and effects of an-

thracosilicosis based upon detailed investigations conducted in three anthracite coal mines. The findings of the study were presented in a report published in 1934.⁵

B. THE OCCUPATIONAL DISEASE ACTS OF 1937 AND 1939

1. ACT OF 1937

The Occupational Disease Compensation Act of 1937,⁶ enacted as a supplement to the Pennsylvania Workmen's Compensation Act of 1915, established separate and distinct provisions for coverage of silicosis, anthracosilicosis, and asbestosis.

a. Eligibility Requirements and Medical Review

The Act of 1937 limited payment of compensation for silicosis, anthracosilicosis and asbestosis to a claimant:

(1) who had an aggregate employment in the Commonwealth of at least *two* years in the eight next preceding the date of disability;⁷

(2) who was employed in an occupation having a silica or asbestosis hazard;⁷

(3) who could show total disability or death caused *primarily* (as definitely distinguished from a contributory or accelerating cause) by silicosis, anthracosilicosis, or asbestosis, or by such causes when accompanied by active pulmonary tuberculosis or streptococcic infection;⁸

(4) whose disability developed within *two* years after the last exposure to the occupational hazard; or, if a death claim, such death to have

⁵ *Anthraco-Silicosis (Miners' Asthma)*, A Preliminary Report of a Study Made in the Anthracite Region of Pennsylvania by U. S. Public Health Service, Harrisburg, Pennsylvania; (Commonwealth of Pennsylvania, Department of Labor and Industry, Bureau of Industrial Standards) 1934.

⁶ 1937, July 2, P. L. 2714.

⁷ *Ibid.* § 5 (a).

⁸ *Ibid.* § 5 (b).

occurred within *five* years following total disability.⁹

In all cases involving claims for silicosis and anthracosilicosis, the Act required controverted medical issues to be referred to a medical advisory board appointed by the Workmen's Compensation Board or referee; and made the reports and findings of the medical advisory board *evidence to be considered together with other medical evidence offered on behalf of the claimant or employer.*¹⁰

b. *Liability*

The Act of 1937 made the employer, in whose employ the employe was last exposed to the occupational hazard, liable¹¹ and provided for compensation payable jointly by the Commonwealth and the employer during the first ten years after the effective date of the Act. For disability or death occurring during the *first* such year, the *Commonwealth's share* was 90 percent and decreased 10 percent each succeeding year until the employer's share reached 100 percent. Thereafter, the Act provided that the employer pay the compensation in full.¹² The liability of the employer was limited to \$3,600.

2. ACT OF 1939

The Pennsylvania Occupational Disease Act of 1939,¹³ which repealed the Act of 1937, was not a supplement to or a part of The Workmen's Compensation Act of 1915; it provided for separate and distinct procedures in the case of silicosis, anthracosilicosis and asbestosis.

⁹ Ibid. § 6 (b).

¹⁰ Ibid. § 10.

¹¹ Ibid. § 9.

¹² Ibid. § 7 (a).

¹³ 1939, June 21, P. L. 566, No. 284.

a. *Eligibility Requirements and Medical Review*

The Act of 1939 limited payment of compensation for silicosis, anthracosilicosis and asbestosis to a claimant:

(1) who had an aggregate employment in the Commonwealth of at least *four* years in the eight next preceding the date of disability;¹⁴

(2) who was employed in an occupation having a silica or asbestos hazard;¹⁴

(3) who could show total disability or death, caused *solely* (as definitely distinguished from a contributory or accelerating cause) by silicosis, anthracosilicosis, or asbestosis, or by such causes when accompanied by active pulmonary tuberculosis;¹⁵

(4) whose disability developed within *one* year of last employment, or if a death claim, such death to have occurred within *three* years after last employment;¹⁶

(5) whose compensation has been agreed upon or one of the parties has filed a petition within *one* year after disability began or death occurred; unless compensation had been paid, then, within *one* year of the date of the most recent payment.¹⁷

Upon appeal to the Workmen's Compensation Board, the Act required controverted medical issues to be referred to a three-member medical board to be appointed by the Secretary of Labor and Industry, with the approval of the Governor.¹⁸ Findings of the medical board were made *conclusive and binding on The Workmen's Compensation Board.*¹⁹ However, no appointments to the medical board were made until

¹⁴ Ibid. § 301 (d).

¹⁵ Ibid. § 301 (e).

¹⁶ Ibid. § 301 (c).

¹⁷ Ibid. § 315.

¹⁸ Ibid. § 402.

¹⁹ Ibid. § 420.

June 1, 1950. (See *Unora v. Glen Alden Coal Co.*, 171 Pa. Superior Ct. 29, 31, footnote.)

b. *Liability*

The 1939 Act made the employer, in whose employ the employe was last exposed to the silica or asbestos hazard for six months or more after the effective date of the Act, liable,²⁰ and provided for compensation payable jointly by the Commonwealth and the employer for ten years from October 1, 1939. During the first *two* years the *Commonwealth's share* was 50 percent, and decreased 10 percent each succeeding 2-year period until October 1, 1949; thereafter, the Act provided that such employer pay the compensation in full.²¹ Maximum compensation was limited to \$3,600.

C. THE ACT OF 1939, AMENDED AND INTERPRETED

Present law consists of the Pennsylvania Occupational Disease Act of 1939, as extensively amended. Generally speaking, amendments have been concerned with (1) increases in the size of maximum awards, (2) liberalization of eligibility requirements, and (3) increased Commonwealth assumption of liability. As a result of the numerous amendments, the administration of the Act has undergone marked changes.

I. LEGISLATIVE AMENDMENTS

a. *Size of Award*

It can be seen in Table 6 that the maximum award for total disability due to silicosis, anthraco-silicosis, or asbestosis increased from \$3,600 in 1939 to \$10,000 in 1956. Concurrently, allowances for medical and funeral expenses have been increased with award changes.²²

²⁰ Ibid. § 301 (g).

²¹ Ibid. § 308 (a).

²² See Appendix Table A-1.

b. *Eligibility and Medical Review*

It would appear that the most consequential change in eligibility requirements subsequent to 1939 was made in 1952.²³ Until amended in 1952, Section 301 (e) read:

“(e) Compensation shall not be payable for partial disability due to silicosis, anthraco-silicosis, or asbestosis. Compensation shall be payable, as otherwise provided in this act, for total disability or death caused *solely* (as definitely distinguished from a contributory or accelerating cause) by silicosis, anthraco-silicosis, or asbestosis, or by silicosis, anthraco-silicosis, or asbestosis, when accompanied by active pulmonary tuberculosis.” (Emphasis supplied.)

Table 6

CHANGES IN SIZE OF MAXIMUM AWARD PAYABLE UNDER THE PENNSYLVANIA OCCUPATIONAL DISEASE ACT OF 1939, AND ITS AMENDMENTS, BY EFFECTIVE DATES

<i>Effective Date of Act</i>	<i>Size of Maximum Award</i>
(1)	(2)
October 1, 1939	\$ 3,600
July 1, 1945	4,000
July 1, 1949	5,000
January 2, 1952	6,500
September 1, 1953	7,500
March 1, 1956	10,000

Note: For further details see Appendix Table A-1.

The amendment of 1952 deleted the phrase “*solely (as definitely distinguished from a contributory or accelerating cause)*” so that as the section now stands it reads:

²³ 1952, January 2, P. L. (1951) 1811, § 1.

"(e) Compensation shall not be payable for partial disability due to silicosis, anthraco-silicosis, or asbestosis. Compensation shall be payable, as otherwise provided in this act, for total disability or death *caused by* silicosis, anthraco-silicosis, or asbestosis, or by silicosis, anthraco-silicosis or asbestosis, when accompanied by active pulmonary tuberculosis." ²³ (Emphasis supplied.)

After the passage of the amendment which removed *solely* from the statute, Leo G. Knoll, then Chairman of the Workmen's Compensation Board observed:

"Under the amendment of January 2, 1952, with the use of the word 'cause' without a qualified condition, the administrative authorities and the Appellate Courts will undoubtedly be in a position to grant compensation for total disability or death where silicosis or anthraco-silicosis is a secondary cause. It appears to the writer that the Legislature definitely intended to broaden the effect of this section and include silicosis cases wherein 'primary' and 'the immediate cause' of total disability or death have a causal relationship." ²⁴

In addition, it should be noted that the medical board was abolished in 1952.²⁵

c. Commonwealth Liability

Commonwealth financial responsibility has been increased directly and indirectly by amendments to the Act of 1939.

Legislative enactments affecting the Commonwealth's financial obligation directly are: (1) The amendment of 1949²⁶ postponing the date of termination of Commonwealth liability from October 1, 1949, to September 30, 1951; (2) the amendment of 1952, providing for the Commonwealth assumption of 40 percent of all compensation payable upon claims arising after September 30, 1951.²⁷

²⁴ 77 PS, Foreword ix, xxi.

²⁵ 1952, January 2, P. L. (1951) 1811, § 4.

²⁶ 1949, May 14, P. L. 1379, § 3.

²⁷ 1952, January 2, P. L. (1951) 1811, § 2.

As regards amendments affecting Commonwealth financial responsibility indirectly, it may be noted that prior to September 1, 1953, Section 301 (g), relating to employer liability, read in part as follows:

"(g) The employer liable for the compensation provided by this article shall be the employer in whose employment the employe was last exposed to the hazard of the occupational disease claimed, regardless of the length of time of such last exposure: Provided, That when a claimant alleges that disability or death was due to silicosis, anthraco-silicosis, asbestosis or any other occupational disease which developed to the point of disablement only after an exposure of five or more years, the only employer liable shall be the last employer in whose employment the employe was last exposed to the hazard of such occupational disease during a period of six months or more after the effective date of this act: . . ."

The amendment of 1953²⁸ added the following proviso to Section 301 (g):

". . . And provided further, That in those cases where disability or death is not conclusively proven to be the result of such last exposure, *all compensation shall be paid by the Commonwealth. . .*" (Emphasis supplied.)

As to the effects of this amendment, the Workmen's Compensation Board, in a unanimous decision, said:

"The purpose or reason for the enactment of Sec. 301 (g) is both obvious and sound. It has always been the practice in the anthracite coal fields for miners and laborers to shop about for the most desirable working places as mining conditions vary from time to time and from mine to mine. A good breast with desirable pitch is more profitable or desirable to the miner and his laborers than a flat one where sheet iron has to be used and the coal pushed by hand. Some miners are accustomed to working in flat work and some on steep pitches, and rather than work in a place to which they are not accustomed, miners will shift from one employer to another.

²⁸ 1953, August 24, P. L. 1389, § 1.

"With the increase in the rate and amount of compensation for silicosis or anthraco-silicosis, it is understandable that no employer would accept a miner with a record of years of employment with another employer because of the potential hazard incident to the occupational disease liability. Hence, the good and experienced miner when once employed, due to the change in working conditions or the closing of a mine, would find it practically (if not totally) impossible to secure employment with another employer. No employer would be willing to assume such a burden in view of the keen competition and profit factor prevailing in this industry.

"Hence, it appears clear and self-evident that the purpose of Sec. 301 (g) was not only to help the anthracite industry but also to prevent workmen from becoming indentured servants of the present employer where they had been exposed to the hazards of anthracite mining for a number of years. Indeed, Sec. 301 (g) is a great humanitarian provision and its help to the anthracite industry, while very important, is also significantly helpful to human freedom and rights.

"It is only too well known that a number of mines have closed in the last few years and it would be indeed a cruel law and great deception to those seemingly benefitted by increased payments if by so doing they are deprived of an opportunity to gain future employment where the mine at which they work is exhausted or forced to close down by the inexorable law of economics. To have won a victory of increased benefits and to have lost the opportunity for employment would indeed appear to be inconsistent with a true definition of justice. To liberalize the benefits of the law, the Legislature had to ameliorate the effects upon an already sick industry and to protect the workmen's freedom of contract, in accordance with the American way of life, which the workers of the anthracite region cherish the same as the workers in the mills, in the factories, on the farms, or in the forests."²⁹

²⁹ *Albert B. Smith v. Glen Alden Corporation*, Opinion of the Workmen's Compensation Board: Appeal No. A-41104, May 8, 1957.

2. JUDICIAL AND ADMINISTRATIVE INTERPRETATIONS

a. *Judicial Interpretations*

A basic judicial precept in the interpretation of compensation laws is that they shall be construed in a liberal manner so as to effectuate their humanitarian purposes. In noting specific applications of this precept, it may be recalled that the interpretation of the concept of total disability, as it is applied in occupational disease cases, arose from interpretations of cases under workmen's compensation laws which preceded occupational disease legislation.

In the interpretation of the Workmen's Compensation Law, the word "disability" has been regarded as synonymous with the loss of earning power. For instance, in the case of *Woodward v. Pittsburgh Engineering & Construction Co.*,³⁰ the Supreme Court stated:

"... The disability contemplated is the loss totally or partially of the earning power from the injury . . ."

This interpretation has been carried over and applied to the occupational disease law.

As the Superior Court observed in the case of *Hurtuk, Appellant, v. H. C. Frick Coke Company*:³¹

"The principal question raised is whether the claimant is *totally* disabled¹ within the meaning of the act.

¹ 'Compensation shall not be payable for partial disability due to silicosis, anthraco-silicosis, or asbestosis.' Compensation is payable only for *total* disability caused by these diseases: *Occupational Disease Act of 1939*, supra.

³⁰ 293 Pa. 338 (1928).

³¹ 157 Pa. Superior Ct. 317 (1945).

The compensation authorities have found that although the claimant is totally disabled as a coal miner, he is able to do work of a lighter nature. Appellant contends that from this finding it must follow, as a matter of law, that claimant is totally disabled. We do not agree with this contention. The Occupational Disease Act of 1939, *supra*, does not define the word 'disabled.' The Occupational Disease Compensation Act of July 2, 1937, P. L. 2714, § 3, 77PS § 1103, repealed by the Act of 1939, provided: "The word "disabled," as herein used, means disabled from earning full wages in the employment in which the employe was employed.' Concerning this definition, we said in *Rando v. State Workmen's Insurance Fund et al.*, 145 Pa. Super. 386, 389, 21 A. 2d 530, 531: '. . . we understand [it] to mean that if the occupational disease prevents the employee from earning full wages in that employment, he is disabled, *partially or totally*, depending on whether he can earn some wages, but not full wages, or none at all.' (Italics supplied.) To determine whether the claimant is partially or totally disabled by the occupational disease, we may use as a guide our workmen's compensation cases involving accidents: *Jones v. Phila. & Reading Coal & Iron Co. et al.*, 154 Pa. Super. 513, 36 A. 2d 172.

"The general rule is that if the claimant is unable to do light work he is entitled to compensation for total disability: *Consona v. R. E. Coulborn & Co. et al.*, 104 Pa. Superior 170, 158 A. 300; *Jones v. Phila. & Reading Coal & Iron Co. et al.*, *supra*. The case of *Babcock v. Babcock & Wilcox Co. et al.*, 137 Pa. Superior 517, 9 A. 2d 492, pointed out the distinction between '. . . those who are able to do light work *in general* and those who are so limited in capacity that they are only fitted to perform *special service* . . .' (Italics supplied.) If the claimant is able to do *light work in general*, he is only *partially* disabled: *Tomlinson v. Hazle Brook Coal Co.*, 116 Pa. Superior 128, 176 A. 853; *Earley v. Phila. & Reading Coal & Iron Co.*, 144 Pa. Superior 301, 19 A. 2d 615; *Hughes v. H. Kellogg & Sons et al.*, 139 Pa. Superior 580, 13 A. 2d 98. After a careful review of the record in the instant case, we conclude there is ample evidence to support the finding of the compensation authorities that the claimant is able to do light work in general, and not only light work of a selective nature as appellant contends. The testimony of

the medical expert definitely indicates that light work in general is what he had in mind. Reading from his report, he first mentioned light work which would not require sustained physical effort. When asked to be more specific, he suggested the jobs of an elevator operator or a watchman. He affirmatively said that the claimant could do the work of an attendant at the lamp house. But these were merely suggestions or examples; no exact type of work was specified. There was not the slightest implication that he could perform only work of a selective nature or highly specialized character. The only restrictions placed by the medical expert were that the work must not require very much physical exertion (light work) and that it be free from the dust of the mine. Since the claimant is able to do light work, it may be presumed that such work is available: *Consona v. R. E. Coulborn & Co. et al.*, *supra*; *Babcock v. Babcock & Wilcox Co. et al.*, *supra*. We think it was properly concluded that the claimant was not totally disabled within the meaning of the act."

The Act of 1939 required that an employe, in order to be eligible for compensation, had to be totally disabled "solely (as definitely distinguished from a contributory or accelerating cause)" by silicosis, anthracosilicosis or asbestosis. In 1952, this phrase was removed from Section 301 (e). Two recent lower court decisions illustrate the possible effect of this amendment.

In the case of *Minaka v. Hudson Coal Company*, 56 Lack. Jur. 101 (1955), the court said concerning Section 301 (e):

"The position of the defendant seems to be that the testimony taken in the light most favorable to the claimant does not meet the standard required by Section 301 (e), 77 P. S. 1401 (e), as amended. This section disallows compensation for partial disability due to anthracosilicosis but only permits compensation for total disability caused by anthracosilicosis. It is to be noted that Section 301 (e), as amended in 1951, . . . struck from the prior law the provision that the total disability or death must be caused 'solely (as distinguished from a contributory or accelerated cause) . . . by anthracosilicosis.' It follows, therefore, and is so

conceded by the defendant that anthracosilicosis no longer need be the sole cause of the disability or death, but the defendant presents the theory that the evidence must support the finding that the degree of anthracosilicosis in itself must be sufficient to cause total disability and, if there is neither evidence nor finding to that effect, that the Board cannot rest any award on a finding that the anthracosilicosis contributes substantially to the total disability.

“. . . It seems, therefore, that the Board was on solid legal ground in its finding that the anthracosilicosis is a cause of the total disability of the claimant, and if it is a cause of the total disability, why therefore is it not compensable? If we do not so hold we are back in practical effect to forcing the claimant to prove that anthracosilicosis would be the sole cause of total disability, contrary to the evident intention of the legislature in removing from the law by the amendment of 1951 the provision that the disability had to result solely from the anthracosilicosis. In our opinion, the Workmen's Compensation Board reached a correct conclusion in its findings of fact, and having done so its conclusions of law based thereon are likewise correct.

"This holding is consistent with the principle of interpretation well expressed in *Nickolay v. Hudson Coal Co.* 164 Pa. Super. Ct. 550, at page 552:

"We are dealing with a statute which must be liberally construed to effectuate its remedial and humanitarian purposes, and a claimant can be debarred from its benefits only by a finding of fact which definitely and expressly excludes him."

Again, the Court of Common Pleas of Schuylkill County said in the case of *Helman v. State Workmen's Insurance Fund, et al.*, 51 Sch. L. R. 117 (1955):

"Can it be said that the decedent's death in the instant case was 'caused by' anthraco-silicosis? It is the opinion of this Court that the legislature in striking out the word 'solely' has relegated this provision of the Compensation Law to the law governing other Occupa-

tional Diseases. This section of the law has now been changed so that claimants suffering with anthracosilicosis, silicosis or asbestosis are now in the same category as claimants suffering from lead poisoning or other Occupational Diseases set forth in Section 108 of the Act of 1939. (Underscoring ours.)

"There is, therefore, no other interpretation that can be given to Section 301 (e) of the amended act. We are, therefore, of the opinion that if a claimant who comes under the Act of 1951 proves that his anthracosilicosis is a contributory or accelerating cause, or that there is a casual [sic] relationship between that disease and his total disability or death, it is a compensable case."

b. *Administrative Interpretations*

Contemporary interpretation of the board with regard to the requirement of Section 301 (g), that total disability be conclusively proven to have resulted from exposure to the hazard of silicosis or anthracosilicosis in the employ of the last employer, is reflected in the following two opinions of the board.

In the case of *Mike Elko v. The Berwind White Coal Mining Company*, A-41131, June 26, 1957, the referee found that the claimant was totally disabled due to anthracosilicosis, awarded compensation and placed the total liability therefor upon the Commonwealth on the basis that it had not been conclusively proven that claimant's disability was the result of his last exposure to the hazard of silicosis in the employ of the Berwind White Company. The issue on appeal by the Commonwealth was as follows:

"WHERE A CLAIMANT IS EXPOSED TO A SILICA HAZARD WITH THE DEFENDANT FOR TEN YEARS FROM 1915 TO 1925, WITH ANOTHER COAL COMPANY FOR EIGHT MONTHS IN 1926 AND AGAIN WITH THE DEFENDANT FOR 26 YEARS, ENDING IN SEPTEMBER, 1955, WAS THE REFEREE JUSTIFIED IN APPLYING SEC. 301 (g) AS AMENDED 1953, AND DIRECTING PAYMENT SOLELY BY THE COMMONWEALTH OF PENNSYLVANIA?" (Emphasis supplied.)

The medical testimony before the referee was to the effect that the degree of anthracosilicosis which the claimant had was the result of *all* exposures to the silica hazard during all of the time that he worked in the soft coal mines. The Workmen's Compensation Board noted this testimony and said:

"... Inferentially then, it means that the 8 month period in the year 1926, when the claimant worked with the Reitz Coal Co., was an instrumental part in bringing about the disablement."

The board noting "... that it is the burden of the Commonwealth to show that the disability or death was brought about as a result of claimant's last exposure to the silica hazard" said:

"We realize that here is a case where *but for eight months out of 37 years of exposure claimant works with one employer*, yet we are not one to legislate but merely a Board to interpret the meaning of the Occupational Disease Act and to apply its scope to a particular case." (Emphasis supplied.)

In sustaining the award of the referee and dismissing the appeal of the Commonwealth, the board concluded:

"... We have borne in mind that we do not wish to become part of an absurd conclusion, yet, we are faced here with a problem which may or may not be rectified by competent medical testimony. Under the circumstances, this Board must affirm the referee's findings of fact, conclusions of law and order of award."

Again, in the case of *Steve Honczar v. Bethlehem Mines Corporation*, A-41133, decided on the same day as the preceding case, the issue was presented as follows:

"WHERE THE CLAIMANT IS EXPOSED TO A SILICA HAZARD WITH ONE EMPLOYER FROM 1920 UNTIL 1923 AND THEN WITH THE DEFENDANT COMPANY FROM 1923 UNTIL THE TERMINATION OF HIS EMPLOYMENT IN 1956, IS THE REFEREE JUSTIFIED IN DIRECTING THAT SEC. 301 (g) IS APPLICABLE AND THAT THE COMMONWEALTH OF PENNSYLVANIA IS RESPONSIBLE FOR ALL COMPENSATION PAYMENTS?"

The Workmen's Compensation Board, in affirming the award of the referee said:

"The medical testimony offered on behalf of the claimant, conclusively establishes that claimant's disability was as a result of his occupation of 36 years employment underground in soft coal mines. The Commonwealth offered no medical testimony to the contrary yet, it requests that we state that the disability was conclusively shown to be as a result of *the last 33 years of exposure*." (Emphasis supplied.)

The board cited its decision in the Elko case and reiterated that it is the obligation of the Commonwealth to show by competent medical testimony that the time spent in employment with another mining company was not an "instrumental period" of exposure when taking into consideration the great length of time spent by claimant in the mines of the defendant.

In passing, it should be noted that alternative conceptions of the continuous existence of a corporate entity have an important bearing upon the interpretation of the words "last employer." If a corporate reorganization effectuates a change in a claimant's employer, the application of the statute of necessity is much wider than if the contrary position is held.

Illustrative of this problem is the case of *Mrs. Stella Tomulonis v. State Workmen's Insurance Fund & Philadelphia & Reading Coal & Iron Company*, A-40513, April 26, 1956:

"An examination of the record reveals that it was agreed upon the record that 'the Philadelphia & Reading Coal & Iron is a new corporation having been organized

and chartered and coming into existence on January 1, 1945.' This corporation was a complete new and separate legal entity from the corporation of the same name, for whom the decedent worked. Therefore, the decedent worked for two distinct employers and there is no *conclusive* proof that the disability and death resulted solely from the last exposure: BEKIAZ VS. PHILA. & READ. COAL & IRON CO., A-39658 (Board 1955)."

Administratively, the referees, in the first instance, and the Workmen's Compensation Board, on appeal, have been faced with the problem of resolving conflicting medical testimony regarding the existence and cause of total disability.³²

In the determination of total disability, board rulings have been in accordance with the judicial interpretations cited above. For example, in the case of *Arthur Ellard v. State Workmen's Insurance Fund and Sarf Coal Company*, A-39774, August 17, 1955, the board, in resolving conflicting medical opinions as to whether or not the claimant was totally disabled, said in affirming the decision of the referee:

"The referee found that the claimant's disability resulting from anthraco-silicosis had reached the extent where he could not perform general work of a light nature but could perform only light work of a selective nature, and that, therefore, his disability was total within the meaning of the Occupational Disease Act. Accordingly, he made an award of compensation in his favor.

"We have carefully reviewed the medical testimony in the case and there is no apparent basic conflict in the

³² Since 1948, 1,750 miners were examined at the Barton Memorial Division of the Jefferson Medical College Hospital. Peter A. Theodos, M.D., was one of the physicians associated with the project. Dr. Theodos' observations regarding the diagnosis and pathology of anthracosilicosis and associated diseases will be found in Appendix B. As Dr. Theodos notes, participation in the project was on a "voluntary" basis as far as affected miners were concerned. Under the circumstances, there is no assurance that the miners thus examined represent a statistically acceptable sample of the total anthracite mining population.

opinions of the various doctors who testified. *The only conflict which appears arises because of different concepts of the meaning of 'total disability,' which is a legal rather than a medical concept.* (Emphasis supplied.)

"We concur in the findings of the referee as above set forth and agree with him that claimant's condition was such that he could not perform general work of a light nature and that he was, therefore, totally disabled within the meaning of the Occupational Disease Act."

With regard to the problem of whether or not total disability or death was "caused by" silicosis, anthracosilicosis or asbestosis, the Workmen's Compensation Board has made the following observations:

In the case of *Joseph Bojack v. State Workmen's Insurance Fund and Philadelphia & Reading Coal & Iron Co.*, A-41030, January 16, 1957:

"One of defendant's medical witnesses found that the claimant was totally disabled due to a heart condition and silicosis. The other doctor called by the defendant found no significant heart condition and was of the opinion that the claimant was only partially disabled due to the anthraco-silicosis. All of the medical opinion is in accord with a finding of *third stage* anthraco-silicosis. It is not necessary for the silicosis to be the *sole* cause of disability. We believe that in this case, the disease is the main cause and that the claimant is totally disabled."

Also, in the case of *Andi Selari v. National Malleable & Steel Castings Co.*, A-39897, April 13, 1955:

"We are of the opinion that the claim is compensable and that the referee's order of disallowance was in error. The referee found:

"SEVENTH: That pulmonary emphysema is the direct cause of claimant's disability which is not compensable under the Occupational Disease Act."

"It is true that emphysema, per se, is not mentioned in the Act as an occupational disease. However, there is acceptable and competent medical testimony that the claimant 'wouldn't have pulmonary emphysema without silicosis and scarrings of his lungs.' We may take cognizance of the fact that emphysema almost invariably is a concomitant of silicosis. Thus, the silicosis cannot be ignored nor minimized as the basic causative factor in the disability picture. . . .

". . . The presence of other conditions are not predominant and the claimant is entitled to a liberal interpretation of the Compensation Acts: VALENT VS. BERWIND-WHITE COAL MINING CO., 172 Pa. Super. Ct. 305. Particularly so, in the light of the amendatory Act of January 2, 1952, P. L. 1811, which eliminated 'solely' in the requirements of silicosis as a cause of total disability."

And then, in the case of *Mrs. Ella Swiger v. Lehigh Navigation Coal Co.*, Misc. 2959, February 15, 1956:

"Although it was not necessary for the claimant to prove that anthraco-silicosis was the *sole* cause of disability or death, nevertheless it was necessary to show that the disease was the fundamental cause of the death. The causal relationship here is too tenuous to support a claim. The weakening of the decedent's stamina or lowering of his resistance because of the ravages of the disease, so that he was more vulnerable to another ailment does not constitute a compensable cause of action: TREASTER VS. NORTH AMERICAN REFRACTORIES CO., 156 Pa. Super Ct. 567. Dr. Mermon's testimony is meager and is not convincing that the death was caused by anthraco-silicosis. The doctor's testimony, under cross-examination by defendant's counsel and by the referee, discounts an acceptance of the opinion that death was due to the silicosis. Under the circumstances, we must again conclude that the claim is not compensable."

Section IV

FUTURE CASE LOAD: A PREDICTION

In view of the increase in Commonwealth expenditures for total disability and death under the occupational disease law, it becomes of critical importance to evaluate, with the means at hand, the case load that is likely to emerge during the coming biennium as well as the approximate magnitude of Commonwealth obligations. The means at hand are deficient in many respects. For instance, no reliable information regarding the incidence of anthracosilicosis is currently available. Again, the intricate interrelations between economic opportunities and individual choices have not been firmly established and are currently subject to alternative interpretations.

Chart VI shows for the period January, 1954, to November, 1958, the *regular* biweekly case load for total disability and death claims. For each biweekly period, the regular case load includes all recipients of compensation payments, exclusive of those for whom first checks or termination checks were drawn.

In addition, the chart presents, for the period June, 1954, to June, 1961, a reference line which shows the past and expected trend of the biweekly case load.

The reference line was extrapolated through the period 1959-1961 on the assumptions that the law does not change, that administrative practices will not change, and that other major determinants of the case load will continue to follow the pattern established in the past.

Examination of the chart indicates that in 1954 and 1955 the case load increased relatively slowly. Beginning at the end of 1955, the case load began to increase at a more rapid rate, and, of late, the rate of increase has apparently been decreasing. It is interesting to compare the deviations between the actual observations (black line) and the reference curve (red line). An examination of the relationship between appropriations and case load indicates that the most marked deviations under review were associated with inadequacies of funds subsequently compensated for by deficiency appropriations.¹

It should be noted that the biennial appropriation of 1957 was exhausted as of August, 1958, and that, since that time, the program has been financed by means of so-called "lapsed" appropriations.² Past experience suggests that shortages of funds affect the case load in the sense that they are associated with case loads of lesser magnitudes than would be expected in the absence of such shortages. Evaluation of the recent behavior of the case load is further complicated by the fifteen-week extension of unemployment compensation payments which became effective June 19, 1958. The projection of the reference line through the biennium 1959-1961, has taken into account the need for additional funds and

¹ For relationship between changes in case load and appropriations, see Appendix Chart A-I.

² See Official Opinion of the Attorney General, No. 126, dated June 23, 1958.

the extension of unemployment compensation benefits.

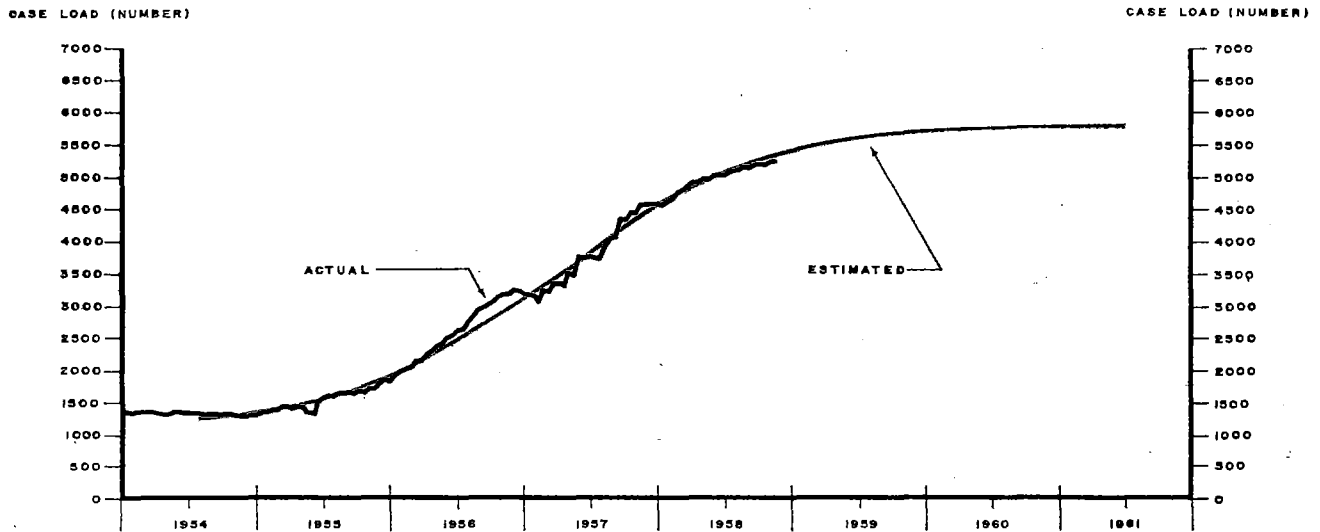
For the biennium 1959-1961, the chart shows an estimated case load of 5,800. In this connection, it should be noted that case load cannot be readily converted into Commonwealth Expenditures incurred in connection with case load. Such a conversion presupposes the existence of detailed information with respect to the relative number of total disability and death benefit awards, the

relationship between awards financed exclusively by the Commonwealth and awards financed jointly by the Commonwealth and employer, and the average size of the so-called "back" payments. On the basis of an evaluation of these factors,³ it would appear that the total Commonwealth expenditures for the biennium 1959-1961 might well be in the neighborhood of \$26 million, exclusive of administrative expenses.

³ For computational details, see Appendix C.

Chart VI

REGULAR BIWEEKLY CASE LOAD FOR TOTAL DISABILITY AND DEATH UNDER THE OCCUPATIONAL DISEASE LAW, JANUARY, 1954 TO NOVEMBER, 1958 WITH PROJECTION TO JUNE, 1961



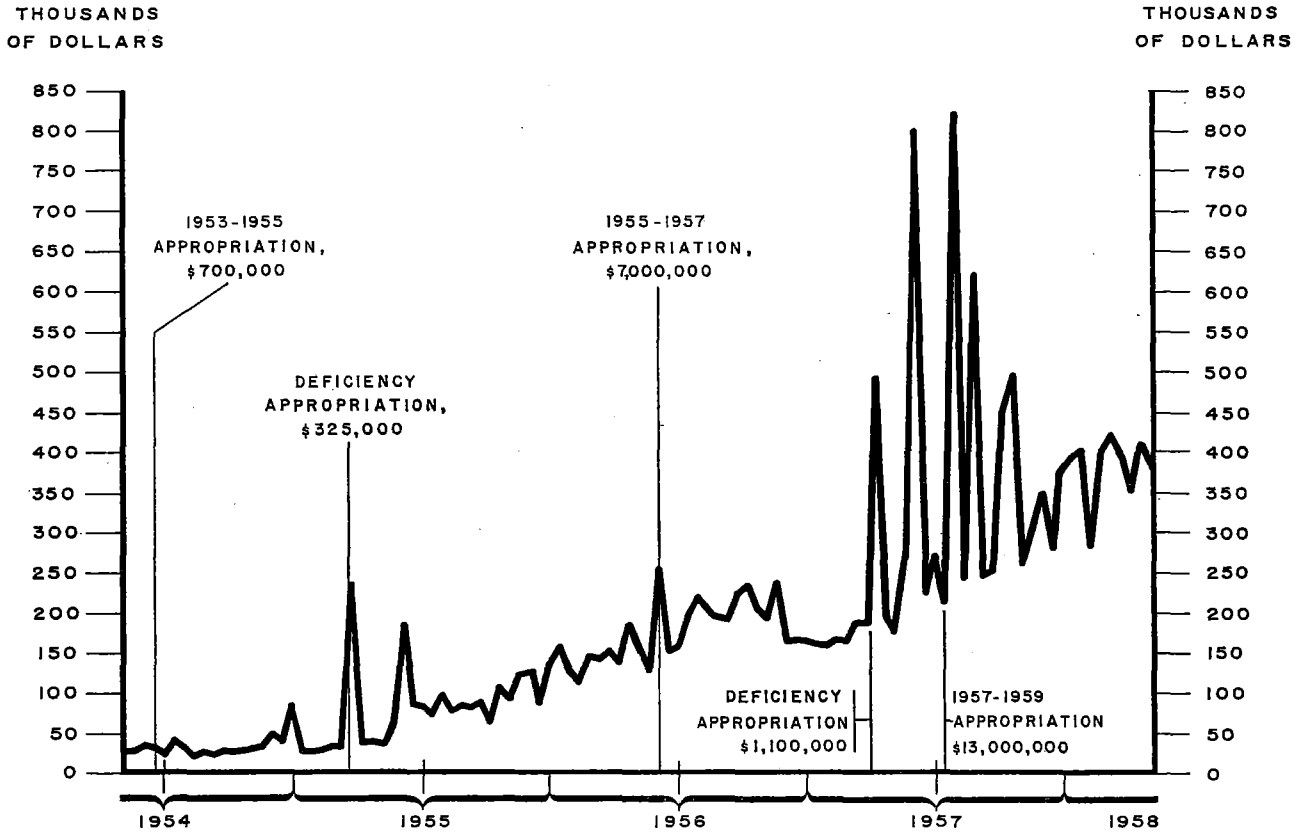
SOURCE: Adapted from data furnished to the Joint State Government Commission by the Pennsylvania Department of Labor and Industry.

Appendix A

SOURCE CHART AND TABLES

Appendix Chart A-I

TOTAL BIWEEKLY EXPENDITURES FOR TOTAL DISABILITY AND DEATH
UNDER THE OCCUPATIONAL DISEASE LAW
PAYROLL PERIODS MAY 5, 1954 TO JANUARY 7, 1958



SOURCE: Adapted from data furnished to the Joint State Government Commission by the Pennsylvania Department of Labor and Industry.

Appendix Table A-1

AWARDS AND PAYMENTS FOR TOTAL DISABILITY AND DEATH DUE TO
SILICOSIS, ANTHRACOSILICOSIS, OR ASBESTOSIS
UNDER THE PENNSYLVANIA OCCUPATIONAL DISEASE ACT OF 1939,
AND ITS AMENDMENTS, BY EFFECTIVE DATES

<i>Effective Date of Act</i> ¹	<i>Disability or Death Award</i> ²	<i>Weekly Benefit</i> ³		<i>Weeks Payable at Maximum Benefit</i>	<i>Maximum Funeral Award</i>	<i>Maximum Medical Award</i>
		<i>Minimum</i>	<i>Maximum</i>			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
10-1-39	\$ 3,600	\$ 9.00	\$18.00	200	\$200	\$150 ^a
7-1-45	4,000	10.00	20.00	200	200	150 ^b
7-1-49	5,000	12.50	25.00	200	250	225 ^c
1-2-52	6,500	20.00	30.00	217	250	225 ^c
9-1-53	7,500	22.50	32.50	231	425	450 ^d
3-30-56	10,000	25.00	37.50	266	425	450 ^e

¹ The amount of compensation payable to a given individual is determined by the law in force at the date of last exposure to the hazard causing disability or death.

² These amounts are exclusive of awards provided for in columns (6) and (7).

³ Applicable to disabled employees only. Separate schedules are provided for survivors.

^a Payable during first 60 days from date of disability.

^b An additional \$75 payable at discretion of Workmen's Compensation Board between 60 and 90 days upon petition of claimant.

^c Payable during first 90 days.

^d Payable during first 120 days.

^e Payable during first 6 months.

Appendix Table A-2
 PRODUCTION OF PRINCIPAL MINERAL FUELS AND WATERPOWER
 CONTINENTAL UNITED STATES
 1900-1956

Year	Anthracite Production in Thousands of Net Short Tons	Production in Trillions of British Thermal Units ¹					Total
		Anthracite Coal	Crude Petroleum	Natural Gas Wet	Bituminous Coal and Lignite	Waterpower	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1900	57,368	1,457	369	254	5,563	250	7,893
1901	67,472	1,714	402	283	5,917	264	8,580
1902	41,374	1,051	515	301	6,818	289	8,974
1903	74,607	1,895	583	319	7,408	321	10,526
1904	73,157	1,858	679	333	7,301	354	10,525
1905	77,660	1,973	781	377	8,255	386	11,772
1906	71,282	1,811	734	418	8,983	414	12,360
1907	85,604	2,174	963	437	10,343	441	14,358
1908	83,269	2,115	1,035	432	8,713	476	12,771
1909	81,070	2,059	1,062	517	9,949	513	14,100
1910	84,485	2,146	1,215	547	10,928	539	15,375
1911	90,464	2,298	1,279	551	10,635	565	15,328
1912	84,362	2,143	1,293	604	11,793	585	16,418
1913	91,525	2,325	1,441	626	12,535	609	17,536
1914	90,822	2,307	1,541	636	11,075	636	16,195
1915	88,995	2,260	1,630	676	11,597	659	16,822
1916	87,578	2,224	1,744	810	13,166	681	18,625
1917	99,612	2,530	1,945	855	14,457	700	20,487
1918	98,826	2,510	2,064	775	15,180	701	21,230
1919	88,092	2,238	2,195	802	12,206	718	18,159
1920	89,598	2,276	2,569	883	14,899	738	21,365
1921	90,473	2,298	2,739	732	10,897	620	17,286
1922	54,683	1,389	3,234	843	11,063	643	17,172
1923	93,339	2,371	4,248	1,113	14,792	685	23,209
1924	87,927	2,233	4,141	1,263	12,672	648	20,957
1925	61,817	1,570	4,430	1,314	13,625	668	21,607
1926	84,437	2,145	4,471	1,452	15,020	728	23,816
1927	80,096	2,034	5,227	1,598	13,563	776	23,200
1928	75,348	1,914	5,229	1,734	13,120	854	22,851
1929	73,828	1,875	5,842	2,118	14,017	816	24,668
1930	69,385	1,762	5,208	2,148	12,249	752	22,119
1931	59,646	1,515	4,936	1,869	10,011	668	18,999
1932	49,855	1,266	4,554	1,729	8,114	713	16,376
1933	49,541	1,258	5,253	1,733	8,741	711	17,696
1934	57,168	1,452	5,267	1,970	9,415	698	18,802
1935	52,159	1,325	5,780	2,136	9,756	806	19,803
1936	54,580	1,386	6,378	2,411	11,504	812	22,491
1937	51,856	1,317	7,419	2,684	11,673	871	23,964

Appendix Table A-2—(Continued)

Year	Anthracite Production in Thousands of Net Short Tons	Production in Trillions of British Thermal Units ¹					Total
		Anthracite Coal	Crude Petroleum	Natural Gas Wet	Bituminous Coal and Lignite	Waterpower	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1938	46,099	1,171	7,043	2,565	9,132	866	20,777
1939	51,487	1,308	7,337	2,763	10,345	838	22,591
1940	51,485	1,308	7,849	2,979	12,072	880	25,088
1941	56,368	1,432	8,133	3,162	13,471	934	27,132
1942	60,328	1,532	8,043	3,436	15,267	1,136	29,414
1943	60,644	1,540	8,733	3,839	15,463	1,304	30,879
1944	63,701	1,618	9,732	4,176	16,233	1,344	33,103
1945	54,934	1,395	9,939	4,423	15,134	1,442	32,333
1946	60,507	1,537	10,057	4,550	13,989	1,406	31,539
1947	57,190	1,453	10,771	5,012	16,522	1,426	35,184
1948	57,140	1,451	11,717	5,615	15,707	1,481	35,971
1949	42,702	1,085	10,683	5,911	11,472	1,539	30,690
1950	44,077	1,120	11,449	6,841	13,527	1,573	34,510
1951	42,670	1,084	13,037	8,106	13,982	1,559	37,768
1952	40,583	1,031	13,282	8,705	12,231	1,581	36,830
1953	30,949	786	13,671	9,116	11,981	1,522	37,076
1954	29,100	739	13,427	9,488	10,262	1,449	35,365
1955	26,200	665	14,410	9,735	12,174	1,447	38,431
1956 ^a	28,900	726	15,181	10,661	13,100	1,542	41,210

¹ The unit heat values employed are: Anthracite, 12,700 B.T.U. per pound; bituminous coal and lignite, 13,100 B.T.U. per pound; petroleum, 5,800,000 B.T.U. per barrel; natural gas, total production 1,075 B.T.U. per cubic foot minus total repressuring vent and waste gas 1,035 B.T.U. per cubic foot. Waterpower includes installations owned by manufacturing plants and mines, as well as by government and privately owned public utilities. The fuel equivalent of waterpower is calculated from the kilowatt-hours of power produced wherever available. Otherwise, the fuel equivalent is calculated from the reported horsepower of installed water wheels, assuming a capacity factor of 20 percent for factories and mines and 40 percent for public utilities.

^a Preliminary.

SOURCES: Committee on Interior and Insular Affairs, *Findings and Recommendations of the Special Subcommittee on Coal Research*, Union Calendar No. 490, 85th Congress, House of Representatives Report No. 1263, 1957; *Minerals Yearbook*, 1957, United States Bureau of Mines.

Appendix Table A-3

PERCENTAGE SHARE OF TOTAL PRODUCTION, IN TERMS OF ENERGY EQUIVALENTS (B.T.U.)
OF THE PRINCIPAL MINERAL FUELS AND OF WATERPOWER
CONTINENTAL UNITED STATES
1900-1956

Year	Percentage					Total
	Anthracite Coal	Crude Petroleum	Natural Gas Wet	Bituminous Coal and Lignite	Water- power	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1900	18.4%	4.7%	3.2%	70.5%	3.2%	100%
1901	20.0	4.7	3.3	68.9	3.1	100
1902	11.7	5.7	3.4	76.0	3.2	100
1903	18.0	5.5	3.0	70.4	3.1	100
1904	17.6	6.4	3.2	69.4	3.4	100
1905	16.8	6.6	3.2	70.1	3.3	100
1906	14.7	5.9	3.4	72.7	3.3	100
1907	15.1	6.7	3.1	72.0	3.1	100
1908	16.6	8.1	3.4	68.2	3.7	100
1909	14.6	7.5	3.7	70.6	3.6	100
1910	14.0	7.9	3.5	71.1	3.5	100
1911	15.0	8.3	3.6	69.4	3.7	100
1912	13.0	7.9	3.7	71.8	3.6	100
1913	13.2	8.2	3.6	71.5	3.5	100
1914	14.3	9.5	3.9	68.4	3.9	100
1915	13.4	9.7	4.0	69.0	3.9	100
1916	11.9	9.4	4.3	70.7	3.7	100
1917	12.3	9.5	4.2	70.6	3.4	100
1918	11.8	9.7	3.7	71.5	3.3	100
1919	12.3	12.1	4.4	67.2	4.0	100
1920	10.7	12.0	4.1	69.7	3.5	100
1921	13.3	15.9	4.2	63.0	3.6	100
1922	8.1	18.8	4.9	64.5	3.7	100
1923	10.2	18.3	4.8	63.7	3.0	100
1924	10.6	19.8	6.0	60.5	3.1	100
1925	7.2	20.5	6.1	63.1	3.1	100
1926	9.0	18.8	6.1	63.1	3.0	100
1927	8.8	22.5	6.9	58.5	3.3	100
1928	8.4	22.9	7.6	57.4	3.7	100
1929	7.6	23.7	8.6	56.8	3.3	100
1930	8.0	23.5	9.7	55.4	3.4	100
1931	8.0	26.0	9.8	52.7	3.5	100
1932	7.7	27.8	10.6	49.5	4.4	100
1933	7.1	29.7	9.8	49.4	4.0	100
1934	7.7	28.0	10.5	50.1	3.7	100
1935	6.7	29.2	10.8	49.2	4.1	100
1936	6.1	28.4	10.7	51.2	3.6	100
1937	5.5	31.0	11.2	48.7	3.6	100
1938	5.6	33.9	12.3	44.0	4.2	100
1939	5.8	32.5	12.2	45.8	3.7	100
1940	5.2	31.3	11.9	48.1	3.5	100
1941	5.3	30.0	11.7	49.6	3.4	100
1942	5.2	27.3	11.7	51.9	3.9	100
1943	5.0	28.3	12.4	50.1	4.2	100
1944	4.9	29.4	12.6	49.0	4.1	100
1945	4.3	30.7	13.7	46.8	4.5	100

Appendix Table A-3—(Continued)

Year	Percentage					Total
	Anthracite Coal	Crude Petroleum	Natural Gas Wet	Bituminous Coal and Lignite	Water- power	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1946	4.9	31.9	14.4	44.3	4.5	100
1947	4.1	30.6	14.2	47.0	4.1	100
1948	4.0	32.6	15.6	43.7	4.1	100
1949	3.5	34.8	19.3	37.4	5.0	100
1950	3.2	33.2	19.8	39.2	4.6	100
1951	2.9	34.5	21.5	37.0	4.1	100
1952	2.8	36.1	23.6	33.2	4.3	100
1953	2.1	36.9	24.6	32.3	4.1	100
1954	2.1	38.0	26.8	29.0	4.1	100
1955	1.7	37.5	25.3	31.7	3.8	100
1956 ^a	1.8	36.8	25.9	31.8	3.7	100

^a Preliminary.

SOURCE: Committee on Interior and Insular Affairs, *Findings and Recommendations of the Special Subcommittee on Coal Research*, Union Calendar No. 490, 85th Congress, House of Representatives Report No. 1263, 1957.

Market

(1)

Total Apparent United States Consumption
Exports

Total Apparent Consumption ¹

Industrial Consumption by Principal Users—

Class I Railroads

Fuel Briquette Industry

Electric Utilities

Coking Coal Industry

Colliery Fuels Used by the Anthracite Industry

Space Heating (Estimate) ²

Exports—Total

Canada

Europe

Other

Imports

¹ Total apparent United States consumption rounded to 100,000's.

² Space heating and industrial consumption including consumption for the year for which an estimate is made.

Note: Comparable to 1954.

SOURCE: *Minerals Yearbook*



Appendix Table A-5
 ANTHRACITE PRODUCTION, AVERAGE EMPLOYMENT AND AVERAGE
 TONS MINED PER EMPLOYEE PER YEAR
 1926-1957

<i>Year</i>	<i>Production Net Short Tons</i>	<i>Average Number of Employees</i>	<i>Average Tons Per Employee Per Year</i>
(1)	(2)	(3)	(4)
1926	84,437,452	165,386	511
1927	80,095,564	165,259	485
1928	75,348,069	160,681	469
1929	73,828,195	151,501	487
1930	69,384,837	150,804	460
1931	59,645,652	139,431	428
1932	49,855,221	121,243	411
1933	49,541,344	104,633	473
1934	57,168,291	109,050	524
1935	52,158,783	103,269	505
1936	54,579,535	102,081	535
1937	51,856,433	99,085	523
1938	46,099,027	96,417	478
1939	51,487,377	93,138	553
1940	51,484,640	91,313	562
1941	56,368,267	88,054	617
1942	60,327,729	82,121	705
1943	60,643,620	79,153	751
1944	63,701,363	77,591	815
1945	54,933,909	72,842	751
1946	60,506,873	78,145	770
1947	57,190,009	78,600	720
1948	57,139,948	76,215	745
1949	42,701,724	75,377	560
1950	44,076,703	72,624	597
1951	42,669,997	68,995	618
1952	40,582,558	65,923	615
1953	30,949,152	57,861	535
1954	29,083,477	43,996	659
1955	26,204,554	33,523	780
1956	28,900,220	31,516	918
1957	25,338,321	30,825	819

SOURCE: *Minerals Yearbook*, 1957, United States Bureau of Mines.



ANT.

Year	Underground		
	Hand Loaded	Percentage of Total Production	Mechanically
	Net Short Tons		Net Short Tons
(1)	(2)	(3)	(4)
1938	27,990,628	60.7%	10,151,660
1939	30,797,715	60.0	11,733,833
1940	29,190,837	56.6	12,326,000
1941	30,435,277	54.0	13,441,987
1942	30,495,240	50.6	14,741,459
1943	27,990,005	46.2	14,745,793
1944	26,800,270	42.1	14,975,146
1945	20,957,744	38.1	13,927,955
1946	22,465,295	37.1	15,619,162
1947	20,909,101	36.6	16,054,011
1948	21,432,923	37.5	15,742,368
1949	15,172,562	35.5	11,858,088
1950	15,820,245	35.9	12,335,650
1951	15,494,452	36.3	10,847,787
1952	14,713,819	36.3	10,034,464
1953	11,054,720	35.7	6,838,769
1954	9,874,373	34.0	6,978,035
1955	7,837,819	29.9	6,660,939
1956	7,746,794	26.8	7,308,110
1957	5,958,574	23.5	6,657,479

* Subtotals shown in columns (2), (4), (6), (8) according to type of mining method for the years 1938,

SOURCE: Adapted from data published in *Mineral*

Appendix Table A-7

MINING AND MANUFACTURING EMPLOYMENT IN THE ANTHRACITE REGION
APRIL 1, 1930, 1940, 1950 AND MARCH 15, 1951-1957

<i>Year</i>	<i>Mining</i>	<i>Manufacturing</i>
(1)	(2)	(3)
1930	158,108	89,181
1940	88,896	65,713
1950	75,414	112,165
1951	70,291	122,329
1952	64,783	118,269
1953	57,936	128,125
1954	46,038	120,440
1955	31,300	122,023
1956	29,808	124,672
1957	30,245	122,366

Note: Data for 1930, 1940, and 1950, from the United States Census; for years 1951 through 1957, from the Pennsylvania Department of Labor and Industry. The Census counted workers at *place of residence* as of April 1. The Pennsylvania Department of Labor and Industry counted workers covered by State unemployment compensation laws, at the pay period ending nearest March 15 at *place of work*. In both series, mining employment covers all mineral extraction.

SOURCES: *Census of the United States*, 1930, 1940 and 1950; *Statistical Information Bulletin* Nos. 99, 107, 110, 116, 123, Department of Labor and Industry, Bureau of Employment Security and additional unpublished data furnished to the Joint State Government Commission by the Bureau.

Appendix Table A-8

VALUE ADDED PER EMPLOYEE AND PERCENTAGE OF TOTAL MANUFACTURING EMPLOYMENT
BY MANUFACTURING INDUSTRY, ANTHRACITE REGION, AND REST OF PENNSYLVANIA
1956

Code Number	Manufacturing Industry Group	Anthracite Region		Rest of Pennsylvania	
		Value Added Per Employee	Percentage of Manufacturing Employment	Value Added Per Employee	Percentage of Manufacturing Employment
(1)	(2)	(3)	(4)	(5)	(6)
20	Food and Kindred Products	\$ 7,330	7.8%	\$ 8,090	7.8%
21	Tobacco Manufacturing	6,330	4.6	5,800	.6
22	Textile Mill Products	4,230	12.4	5,650	6.1
23	Apparel and Related Products	2,970	39.0	3,800	8.5
24	Lumber and Wood Products	4,500	.7	5,050	1.0
25	Furniture and Fixtures	5,120	1.5	6,490	1.4
26	Paper and Allied Products	a	.9	9,360	2.9
27	Printing and Publishing	a	3.9	8,180	3.9
28	Chemicals and Allied Products	14,390	2.1	14,660	3.2
29	Products of Petroleum and Coal	3,210	.2	14,490	1.8
30	Rubber Products	6,090	.5	12,070	1.0
31	Leather and Leather Goods	3,580	4.4	4,550	2.0
32	Stone, Clay and Glass Products	6,180	.8	9,090	5.0
33	Primary Metal Industries	8,720	4.7	9,590	19.4
34	Fabricated Metal Products	8,300	3.1	7,900	7.8
35	Machinery (Except Electrical)	a	3.2	8,670	9.2
36	Electrical Machinery	6,320	3.6	8,830	9.2
37	Transportation Equipment	7,690	3.2	8,380	5.1
38	Professional and Scientific Instruments	4,040	.1	8,090	1.5
39	Miscellaneous Manufacturing Industries ¹	4,660	3.3	6,490	2.6
	All Manufacturing	5,010	100.0	8,270	100.0

¹ Includes ordnance and accessories.

^a To avoid disclosure, value added per employee in the Paper and Allied Products, Printing and Publishing, and Machinery (except Electrical) Industry Groups for the anthracite region is not shown. In the anthracite region, value added per employee for these groups combined was \$6,250, as compared with \$8,670 in the rest of the state.

SOURCE: Based on 1956 *Industrial Census of Pennsylvania*, Pennsylvania Department of Internal Affairs, and additional unpublished data furnished to the Joint State Government Commission by the Department.

Appendix B

MEDICAL ASPECTS OF ANTHRACOSILICOSIS

By Peter A. Theodos, M.D.



INTRODUCTION

A research program for the study and treatment of anthracosilicosis at the Barton Memorial Division of the Jefferson Medical College Hospital was initiated in 1948 under auspices of the Anthracite Health and Welfare Fund. The purpose of the research program sponsored by the Fund was to evaluate the nature and degree of the breathing difficulty experienced by miners and to determine its relationship to the heart and lungs. A complete cardio-pulmonary laboratory was established at Barton and all aspects of lung function were studied. Various physiological tests and methods were used for evaluating the impairment of lung function.

To date, (December 1958) some 1,750 miners have been studied. Patients for study are unselected, the

only requirement for admission to the project being membership in the United Mine Workers' Union. Application for study is voluntary and patients are admitted in order of application. On admission to the hospital a complete medical and industrial history is taken, a complete physical examination is done and a number of routine laboratory and X-ray studies are carried out. If presence of disabling medical conditions such as tuberculosis, heart disease, and cancer is determined, patients are referred back to their own family physicians for treatment. Miners with respiratory impairment related to their occupation are the subjects of intensive physiological studies.

ANTHRACOSILICOSIS AND LUNG FUNCTION IMPAIRMENT

Development and Pathology of Anthracosilicosis

Anthracosilicosis, or "miner's asthma", are two synonymous terms applied to silicosis developed by hard coal miners. It is a disease which commonly results from inhaling the dust produced as the miner drills through solid rock. The dust contains silicon dioxide or quartz, which is the irritant. Coal dust itself is basically carbon and is believed to be incapable of producing damage similar to silicosis. The designation "miner's asthma"—which had its origin in the shortness of breath and wheezing that also characterizes anthracosilicosis—does not signify that the miner has true allergic asthma. In the case of anthracosilicosis, the shortness of breath is primarily due to the presence of emphysema, which is a stretching of the air sacs and a loss in their elasticity; the wheezing is due to the associated bronchitis, which is a narrowing of the air passages in the lungs.

The development of anthracosilicosis depends upon a sufficient exposure to a silica hazard, which is char-

acterized by the presence of silicon dioxide in a free state, with particle size generally between .3 and 5 microns in diameter, and having a concentration of at least 5 to 10 million particles per cubic foot.

Different miners exposed to the same hazard do not necessarily develop anthracosilicosis at the same rate or to the same degree. Individual susceptibility or predisposition may play a part; but this is not an inheritable characteristic. Miners with abnormalities in the air passages of the nose and throat which interfere with cleansing actions of these organs may develop anthracosilicosis more rapidly.

Anthracosilicosis is characterized by generalized fibrotic changes (the development of scar tissue) of varying types. These changes range from discrete nodules to conglomerate masses. The typical nodule is made up of concentric whorls of scar tissue and its altered forms. This fibrous response is generally be-

lieved to be related to the chemical action of silica dust. When the dust particles reach the alveoli, which are the air sacs located in the terminal portions of the lung, they are picked up by certain cells which carry them through the alveolar walls into the surrounding tissue spaces. The silica particles dissolve in the tissue juices to form silicic acid. This acid, in turn, stimulates the formation of fibrosis in the channels which drain the tissue spaces. These lymph channels become occluded and widespread nodulation occurs about the arteries and veins surrounding the bronchi (air passages in the lungs). Generally coalescence and conglomeration of the nodules is the ultimate result of this process.

Classification and Diagnosis of Anthracosilicosis

The classical concept of anthracosilicosis recognizes first, second, and third stages, the third stage including nodular, coalescent nodular, and conglomerate forms. The traditional diagnosis and classification of anthracosilicosis is based upon the presence and size of nodules as seen on the X-ray film. Stage one is considered to consist of diffuse or widely scattered nodules up to 2 millimeters in diameter; stage two, of nodules from 2 to 5 millimeters in diameter; and stage three, of nodules over 5 millimeters in diameter which may be discrete or joined, to form larger coalescent nodular and conglomerate masses.

Research at Barton, however, has shown that there are some cases where miners with a long period of exposure to the silica hazard may have anthracosilicosis but whose X-rays are essentially negative or may show changes which are not typically nodular. These may be classified as borderline anthracosilicosis where only accentuation of the lung markings is present, and atypical or linear where fibrosis without nodulation is present. The atypical or linear forms may be classified as stage one or two according to the amount of fibrosis present. Analysis of the 1,750 cases so far studied shows the following percentage breakdown as regards their X-ray classification:

Negative—3.3%
 Borderline—2.5%
 First Stage
 Nodular—4.7%
 Atypical—3.5%

Second Stage

Nodular—11.6%
 Atypical—5.2%

Third Stage

Nodular—6.5%
 Coalescent Nodular—29.2%
 Conglomerate—33.5%

It will be seen that 5.8 percent are classed as negative or borderline and that the atypical forms account for 8.7 percent. The great majority of X-rays (69.2 percent) are classed as third stage.

In this particular series, a diagnostic problem as to borderline or atypical forms involved about 10 percent of the group studied. A means now exists for investigating this type of case. It is possible to obtain a representative piece of lung tissue through a small incision under local anesthesia for examination under the microscope. The usual site of biopsy is the front part of the chest where the rib spaces are wider. No part of the rib is removed. As the covering of the lung (the pleura) is opened, the lung is kept expanded by oxygen given under pressure through a snugly fitting mask. As the lung protrudes through the incision the surgeon removes one or more pieces of tissue by any of a number of techniques. This technique can be applied to patients even if they are very short of breath.

Microscopic examination of the tissue after proper preparation and staining offers a reliable guide to the presence or absence of anthracosilicosis in the sample tissue. The diagnosis of anthracosilicosis was established through this means in 3 out of the 14 borderline cases which were biopsied and 4 out of 8 atypical cases biopsied.

This evidence indicates that the diagnosis of anthracosilicosis can be established in certain cases where the X-ray does not give the classical appearance; that is, lung biopsy can be done in those cases where anthracosilicosis might be expected in view of a patient's exposure to a silica hazard but where the X-ray is not confirmatory.

Lung Function Impairment

Anthracosilicosis is generally incapacitating. It is a disease which produces impairment of the lung function though there is wide variation from case to case

in the nature and degree of impairment produced. Physiologically, lung function impairment is defined in terms of the ability of the lung to take in oxygen and expel carbon dioxide.

The degree of impairment can be evaluated by clinical methods or by use of laboratory procedures which measure the lung function. Much can be learned from the history, physical examination, X-ray examination and exercise tolerance tests but such studies as vital capacity, maximum breathing capacity, blood oxygen saturation and carbon dioxide retention are much more reliable in determining the ability of the lungs to carry out their function. Adequate physiologic studies of lung function require measurements of ventilation, or the movement of air in and out of the lungs, and of the respiratory gas exchange, or getting the air down to the air sacs and into the blood. These tests require complicated laboratory equipment which is generally not available except in larger hospitals.

The test of a miner's vital capacity, taken as the sole measurement of lung function impairment, is not very informative. The vital capacity test measures only one small part of the total lung function. Even with detailed physiological studies, an accurate determination of lung function impairment in terms of percentage is not possible. Impairment can only be classified in general categories, which define the degree of impairment as: slight, moderate, marked, and very marked.

Only in the broadest terms is it possible to relate these classifications of lung function impairment to legal tests of disability as applied in compensation cases, such as the concept of ability to do light work of a general nature or ability to do light work of a selective nature.

The degree of lung function impairment has in the past been considered to be directly related to the stage of anthracosilicosis (fibrosis) as indicated by the X-ray; that is, some impairment with stage one and severe impairment with stage three. However, on the basis of recent research, it appears that both the first and third stages of anthracosilicosis, to take the extremes, may produce equally divergent degrees of impairment in different patients. First stage anthracosilicosis, as well as third stage may produce little, if any impairment in some patients and marked impairment in others.

Stated in other terms, the amount of lung function impairment is generally independent of the amount of fibrosis.

Lung function impairment must be considered in terms of the degree of emphysema and the distribution factor. Emphysema is a stretching or enlargement of the air sacs with loss of elasticity. The degree of emphysema is related rather closely to the degree of lung function impairment. A miner with stage one anthracosilicosis and an advanced degree of emphysema may be severely impaired whereas a miner with stage three anthracosilicosis and no emphysema may show little if any lung function impairment. The distribution factor, where unequal amounts of air reach the air sacs and, consequently, decreased amounts of oxygen reach the blood vessels, also influences lung function impairment. Equal amounts of air may not reach all parts of the lung because the passage of air may be blocked by spasm of the walls of the bronchial tubes or by plugs of mucus, conditions commonly seen in cases of anthracosilicosis and/or emphysema.

These two factors cannot be accurately determined clinically without special equipment but ordinary methods of examination may fairly well indicate the degree of emphysema present if very little or a great deal is present. The degree of emphysema, to have meaning, must be measured in terms of the residual air percentage of total lung volume. The residual air refers to the volume of air trapped in the lungs after the greatest possible expiration. This is used as a measure of the degree of emphysema. A residual air 25 percent of total lung volume is considered normal; 25 to 35 percent as a slight degree of emphysema; 35 to 45 percent as moderate; 45 to 55 percent as marked, and anything above this as very marked.

Emphysema is not limited to people exposed to the silica hazard but is found in the general population as it grows older. Emphysema resulting from silicosis is not distinguishable from emphysema due to other causes, such as allergic asthma, chronic bronchitis and tuberculosis. However, emphysema is much more frequently seen in silicotics than in the general population which suggests a causal relationship. Emphysema found in a silicotic miner is generally considered to be a result of the anthracosilicosis.

Anthracosilicosis and the Heart

Another aspect of the problem of anthracosilicosis is its effect on the heart. As a result of the fibrosis and emphysema the function of the air sacs is impaired and a state of chronic unsaturation of the blood occurs. This in turn stimulates more fibrosis, with obliteration of the blood vessels in the lung and increased resistance in the circulation of blood in the lung. This leads to elevation of the blood pressure in the lungs and eventually results in strain of the right side of the heart. Right heart strain (or cor pulmonale) is more closely related to the degree of emphysema than to the amount of silicosis. It may aggravate the lung function impairment present but does not in itself produce it—in other words, it may contribute to but not cause the lung function impairment.

Anthracosilicosis and Tuberculosis

On the basis of recovery of acid-fast bacilli in the sputum, about 15 percent of the group of 1,750 studied were shown to have tuberculosis

The X-ray diagnosis of tuberculosis in the presence of silicosis is frequently based upon the presence of cavities in the lung. It is now recognized that some of these cases do not represent tuberculosis but that the cavitation is due to so-called aseptic or ischemic necrosis. This condition occurs when the blood supply to an area of fibrosis generally of the conglomerate type, is cut off and liquifaction results. The patient may bring up copious amounts of black sputum but has none of the toxicity characteristic of tuberculosis.

SUMMARY

The study undertaken at the Jefferson Medical College Hospital thus far points up that (1) anthracosilicosis exist in atypical forms which can be positively diagnosed in some cases by lung biopsy, (2) lung function impairment is more closely related to emphysema and the distribution factor (unequal alveolar aeration and per-

fusion) than to the stage of anthracosilicosis (degree of fibrosis), (3) right heart strain is more closely related to the degree of emphysema than to the degree of anthracosilicosis, and (4) in cases involving lung cavities, tuberculosis cannot be positively diagnosed without a sputum positive for tubercle bacilli.

Appendix C

TECHNICAL NOTES

ESTIMATION OF REFERENCE LINE

Examination of the changes in the biweekly case load for the period January, 1954 to November, 1958, suggested that the underlying trend had the characteristics of a logistic curve; a lower asymptote, a point of inflection and an upper asymptote. A general formula for the logistic curve is:

$$Y = \frac{k}{1 + 10^{a_0 + a_1 X + \dots + a_{n+1} X^{n+1}}}$$

where Y = case load
 k = upper asymptote
 X = unit of time

Since the data did not justify the fitting of a symmetrical logistic curve using traditional methods, a non-symmetrical curve was fitted by successive approximation. In brief, the procedure was as follows:

1. The actual number of cases was plotted for each biweekly period from January, 1954 to November, 1958.
2. A smooth free-hand curve was fitted to the plotted points in such a way that the sum of the squared deviations from these points approximated zero.
3. The first differences of equidistant points on the curve were plotted. The resulting curve supported the conclusion that the underlying trend of the case load had the characteristics of a logistic function and provided the basis for an estimate of the upper asymptote.
4. Once the upper asymptote was determined the formula for the reference line was calculated to be:

$$Y = \frac{5800}{1 + 10^{.542 + .025 X - .0172 X^2 + .00035 X^3}}$$

ESTIMATION OF COMMONWEALTH EXPENDITURES FOR THE BIENNIUM, 1959-1961

The following procedure was employed to estimate Commonwealth expenditures for the biennium 1959-1961:

1. The average number of persons receiving regular biweekly checks during the 1959-1961 biennium was estimated on the basis of the projected reference line. The average size of the regular biweekly check was estimated on the basis of a projection of the changing composition of the case load in terms of (a) average size of award, (b) average percentage of Commonwealth liability, and (c) average primary beneficiary-survivor ratio. The product of these estimates provided an estimate of total Commonwealth expenditures for the biennium 1959-1961, on account of regular biweekly payments.
2. Commonwealth expenditures for first payments to recipients of occupational disease awards were estimated on the basis of (a) projections of the number of new cases added biweekly, (b) the average period covered by the first check, and (c) the average size of the award.
3. Commonwealth expenditures for termination payments to recipients of occupational disease awards were estimated on the basis of projections of the number of biweekly terminations and the average termination payment.
4. Commonwealth expenditures for medical and funeral awards were estimated on the basis of a projection of the average size of these payments taking into account the changing composition of the case load in terms of size of award.
5. The summation of the above estimates provided an estimate of total Commonwealth expenditures (excluding administration) for the biennium, 1959-1961, of \$26,000,000.

