



**From large administrative databases to individual clinics’ experiences: Multiple data sources all point to an increase in progressive massive fibrosis among coal miners**

Silica Exposure and Lung Disease in the Mining Industry:  
NIOSH/MSHA Respirable Mine Dust Virtual Workshop

Scott Laney, PhD  
October 22-23, 2020

## Data Sources for Coal Workers' Pneumoconiosis

- NIOSH Coal Workers Health Surveillance Program (CWHSP)
- MSHA Part 50 Accident and Illness Reporting
- Medical Records at Healthcare Facilities
- Mandatory Reporting to State Health Department
- Department of Labor Division of Coal Mine Workers' Compensation (Federal Black Lung Program)
- State Compensation Programs
- CDC National Center for Health Statistics National Vital Statistics System Mortality Data
- National and Center-Based Lung Transplant Registries

# Continued Increase in Prevalence of Coal Workers' Pneumoconiosis in the United States, 1970–2017

David J. Blackley, DrPH, Cara N. Halldin, PhD, and A. Scott Laney, PhD, MPH

**Objectives.** To update prevalence estimates for coal workers' pneumoconiosis (CWP) among working underground coal miners in the United States.

**Methods.** We conducted a prevalence study using radiographs collected from 1970 to 2017. We classified each radiograph using international standards. We defined CWP as the presence of small opacities, with profusion greater than or equal to subcategory 1/0, or the presence of a large opacity larger than 1 centimeter.

**Results.** Following a low point in the late 1990s, the national prevalence of CWP in miners with 25 years or more of tenure now exceeds 10%. In central Appalachia (Kentucky, Virginia, West Virginia), 20.6% of long-tenured miners have CWP. When we excluded miners from central Appalachia, the prevalence for the remainder of the United States was lower, but an increase since 2000 remains evident.

**Conclusions.** The national prevalence of CWP among working coal miners is increasing. This increase is most pronounced in central Appalachia. Current CWP prevalence estimates will likely be reflected in future trends for severe and disabling disease, including progressive massive fibrosis.

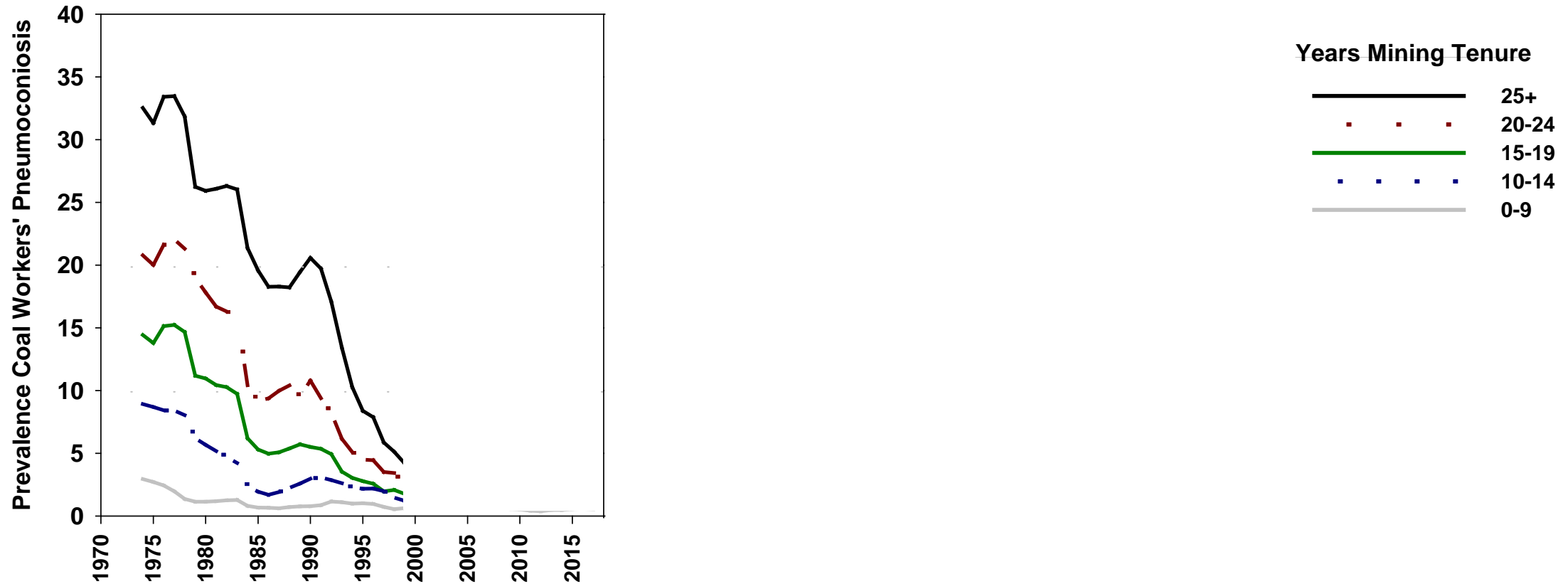
**Public Health Implications.** Recently enacted protections to prevent coal mine dust exposure and identify CWP at its early stage remain essential to protect US coal miners. (*Am J Public Health.* 2018;108:1220–1222. doi:10.2105/AJPH.2018.304517)

Appalachian coalfields. Many of these former miners were seeking compensation through the Federal Black Lung Program, which provides benefits to miners disabled by CWP.

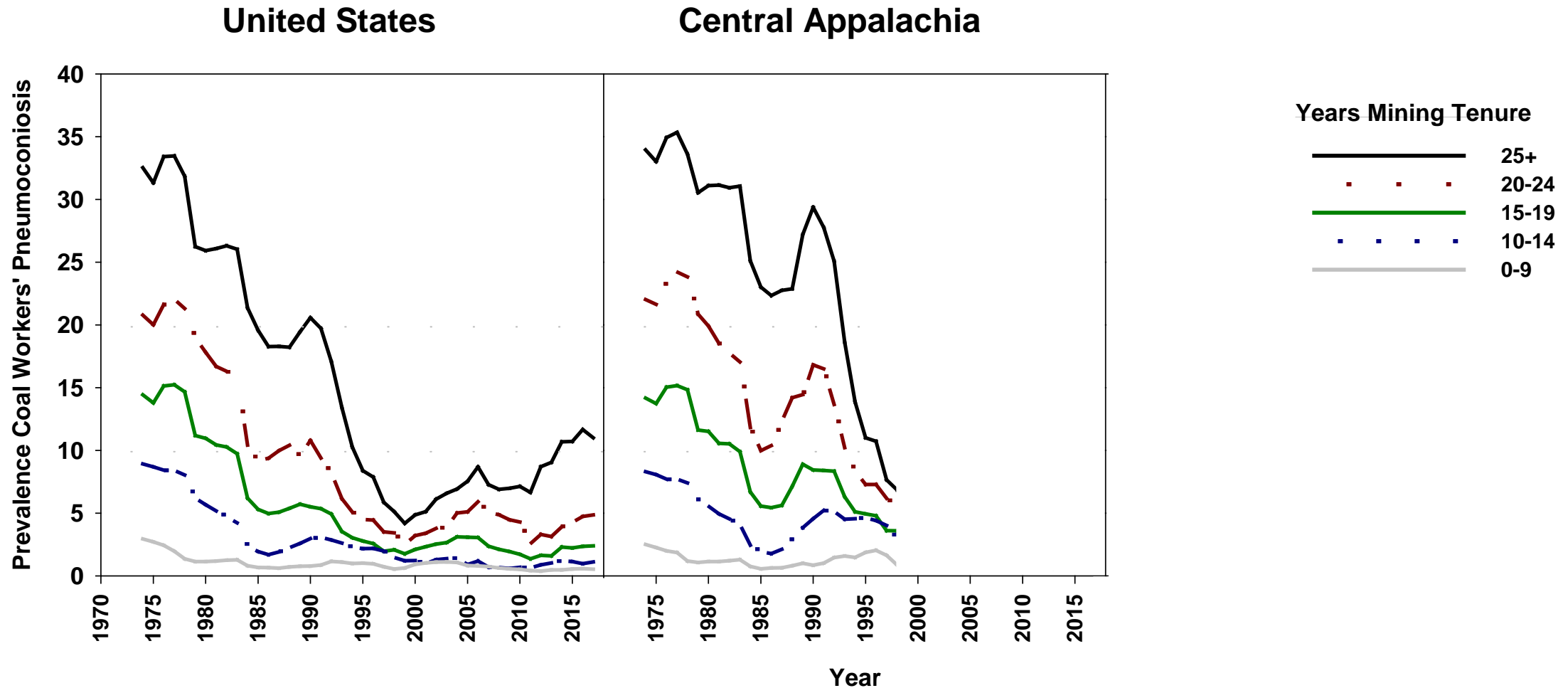
The core mission of the CWHSP is to serve working coal miners, and NIOSH does not systematically offer screening chest radiographs to former miners. However, because CWP is a chronic and progressive disease, current CWP trends in the working coal miner population will influence future PMF trends. Using the most recent data from the CWHSP, and a moving average calculation to account for the 5-year surveillance cycle, we update national prevalence trends for CWP among working underground coal miners in the United States, including a sub-analysis restricted to central Appalachia.

# Radiographic Findings of Pneumoconiosis Among Underground Coal Miners Participating in CWHSP by Mining Tenure (5-year moving average)

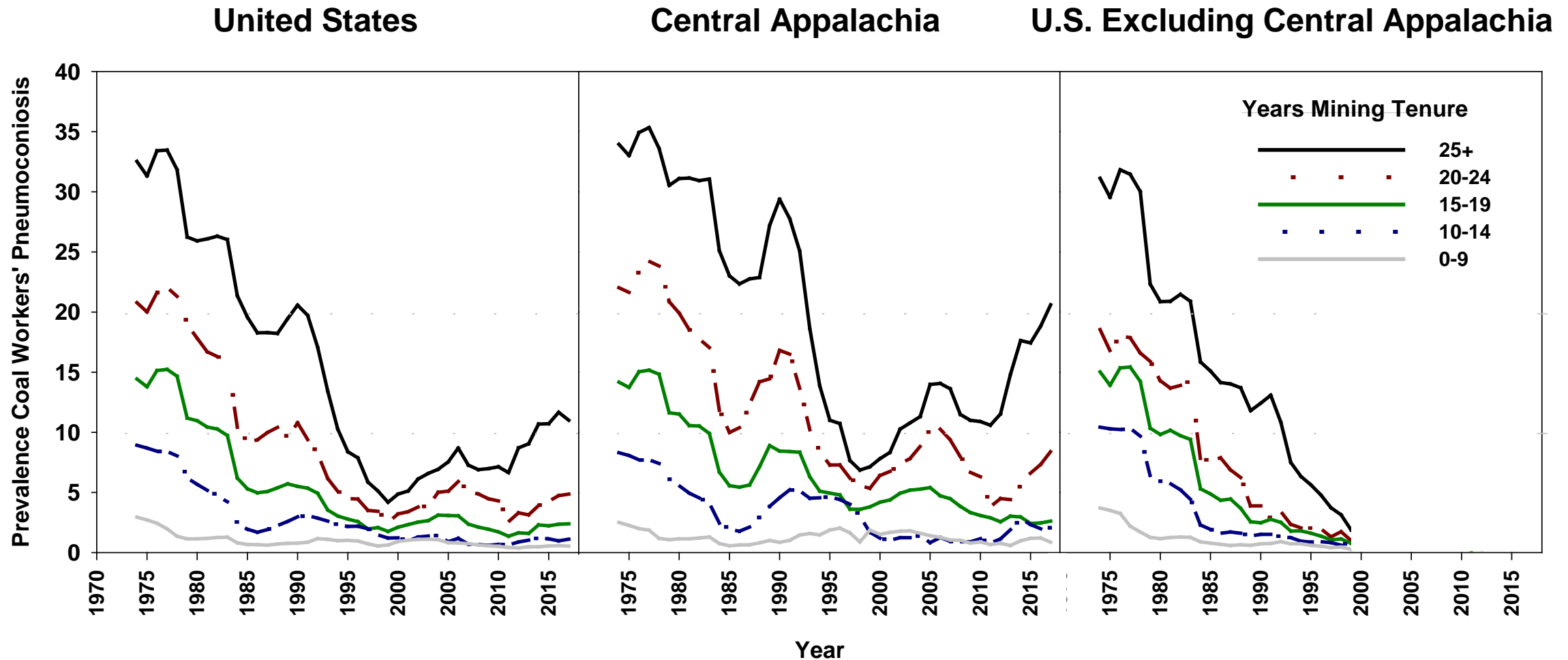
## United States



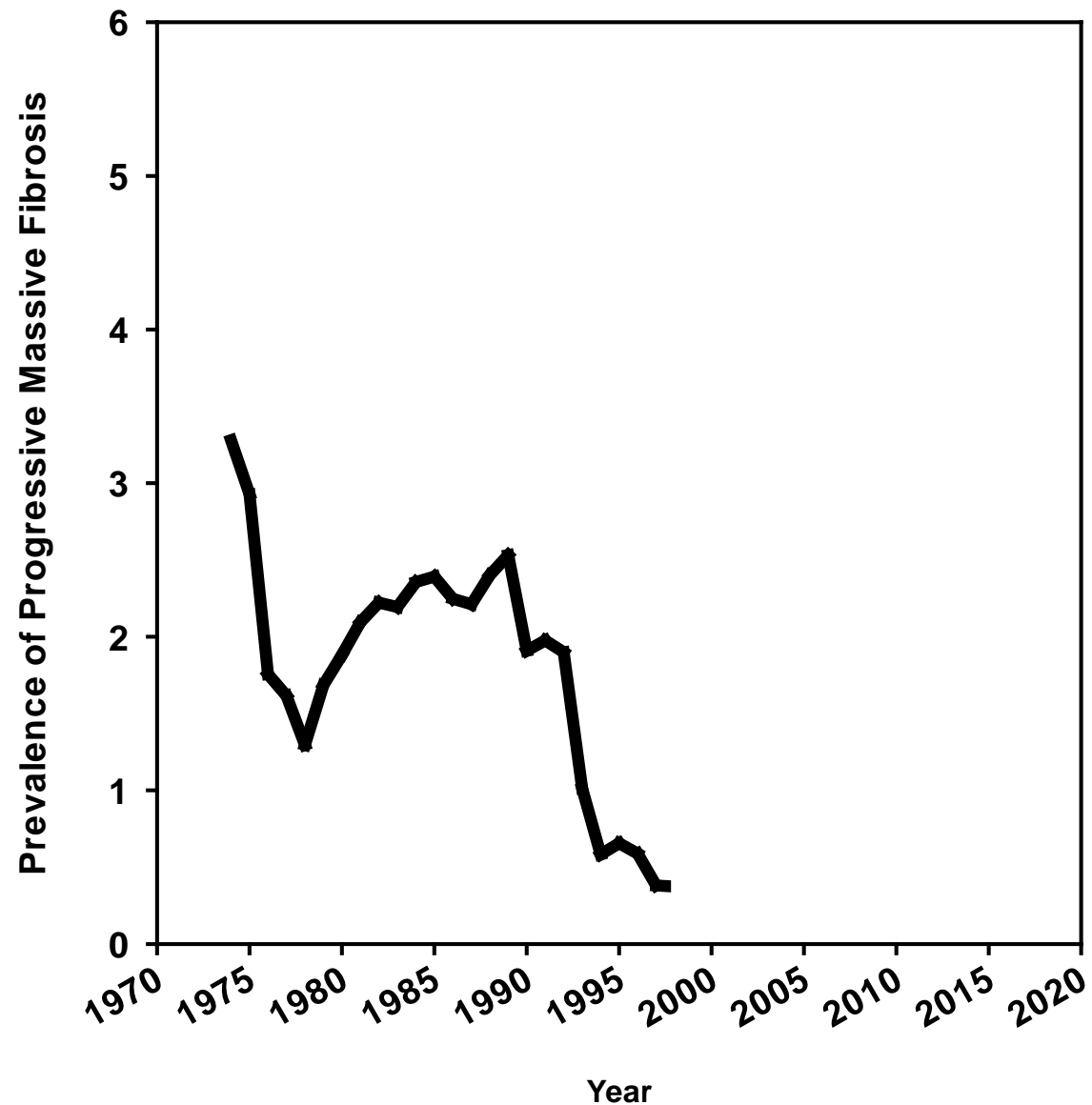
# Radiographic Findings of Pneumoconiosis Among Underground Coal Miners Participating in CWHSP by Mining Tenure (5-year moving average)



# Radiographic Findings of Pneumoconiosis Among Underground Coal Miners Participating in CWHSP by Mining Tenure (5-year moving average)

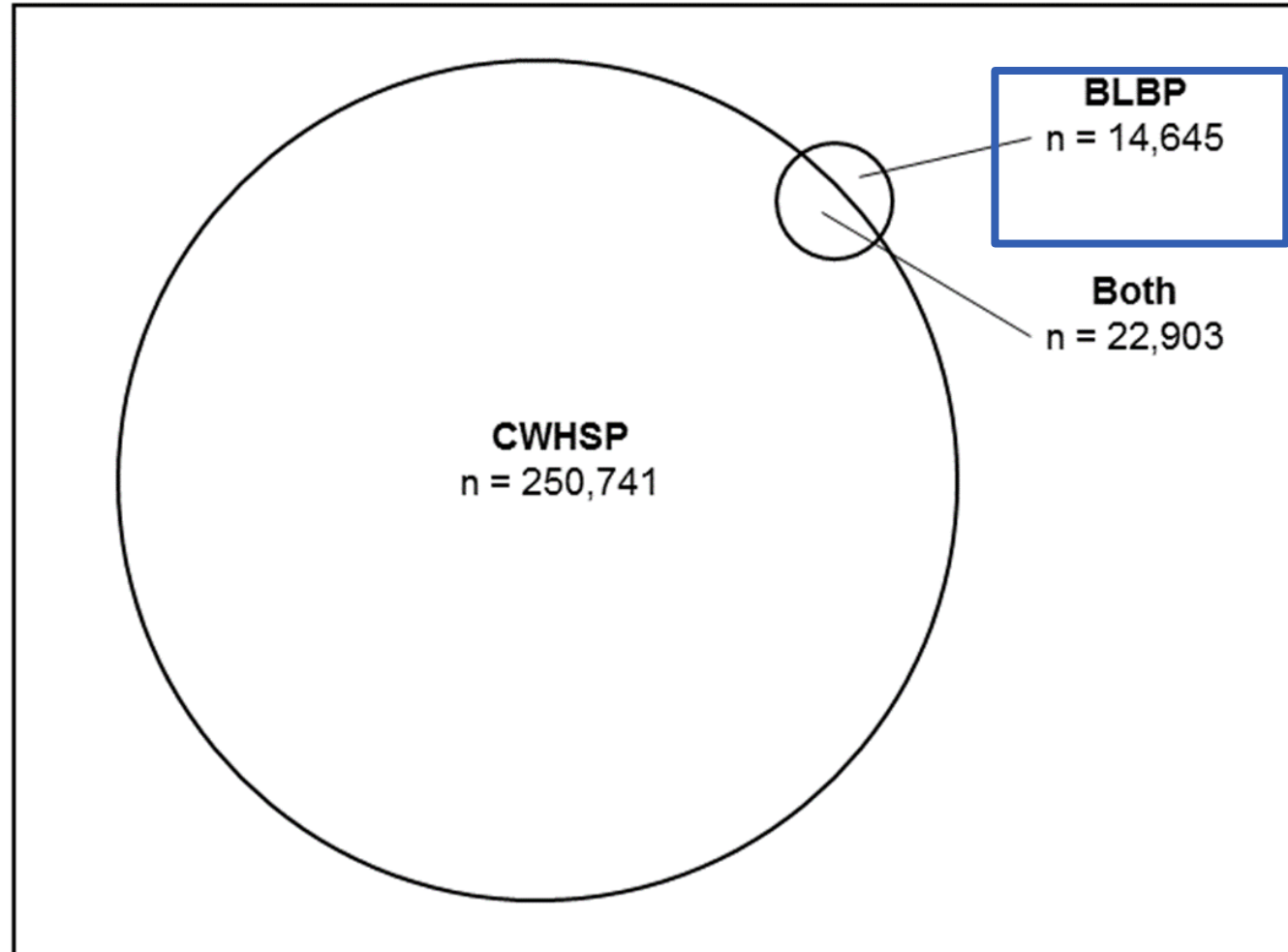


# Prevalence of PMF among working long-tenured miners participating in the CWHSP — Central Appalachia, 1974–2018 (5-year moving average)



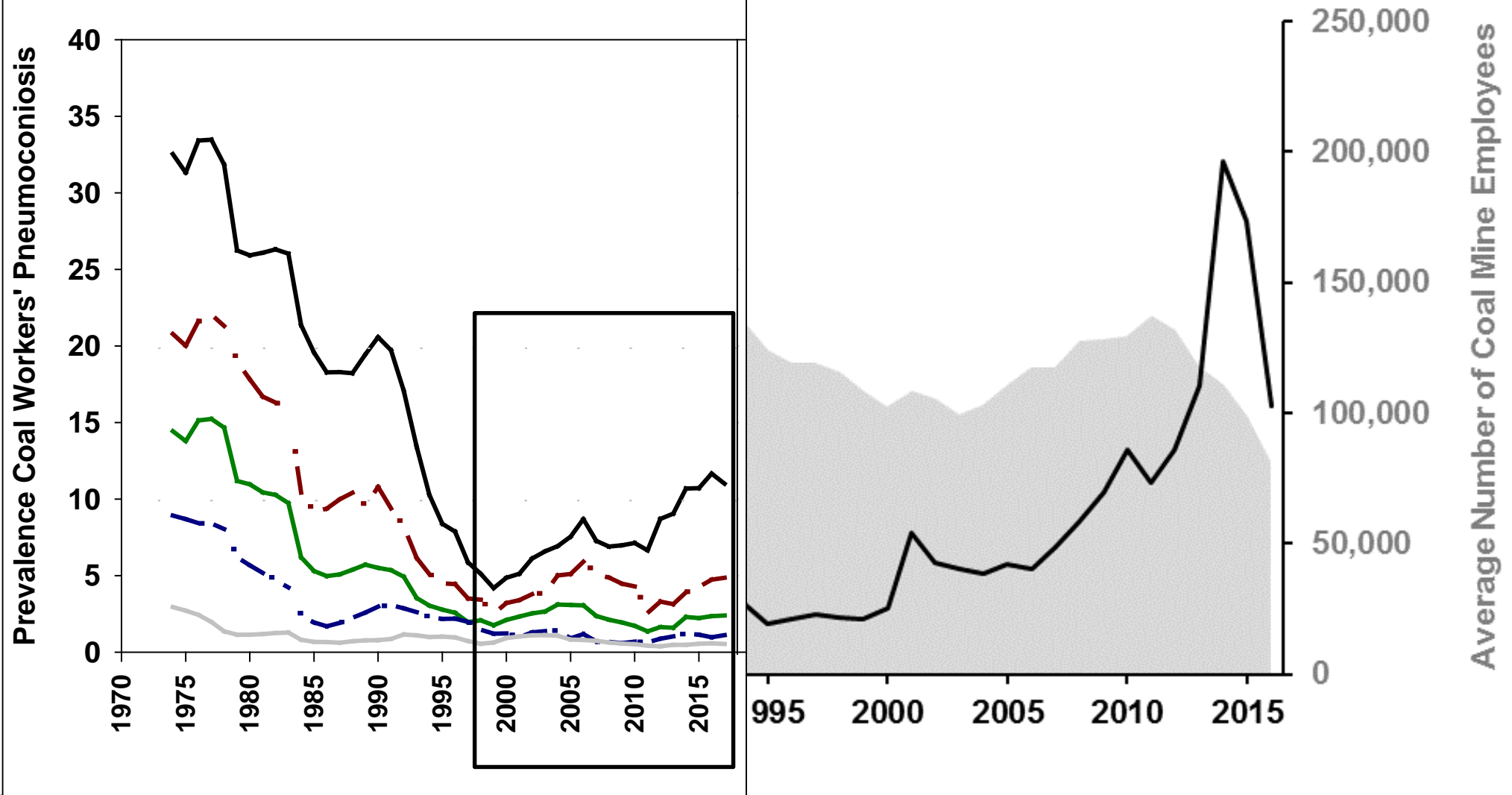
Progressive Massive Fibrosis

# CWHSP and Black Lung Benefits Program (BLBP)





# United States



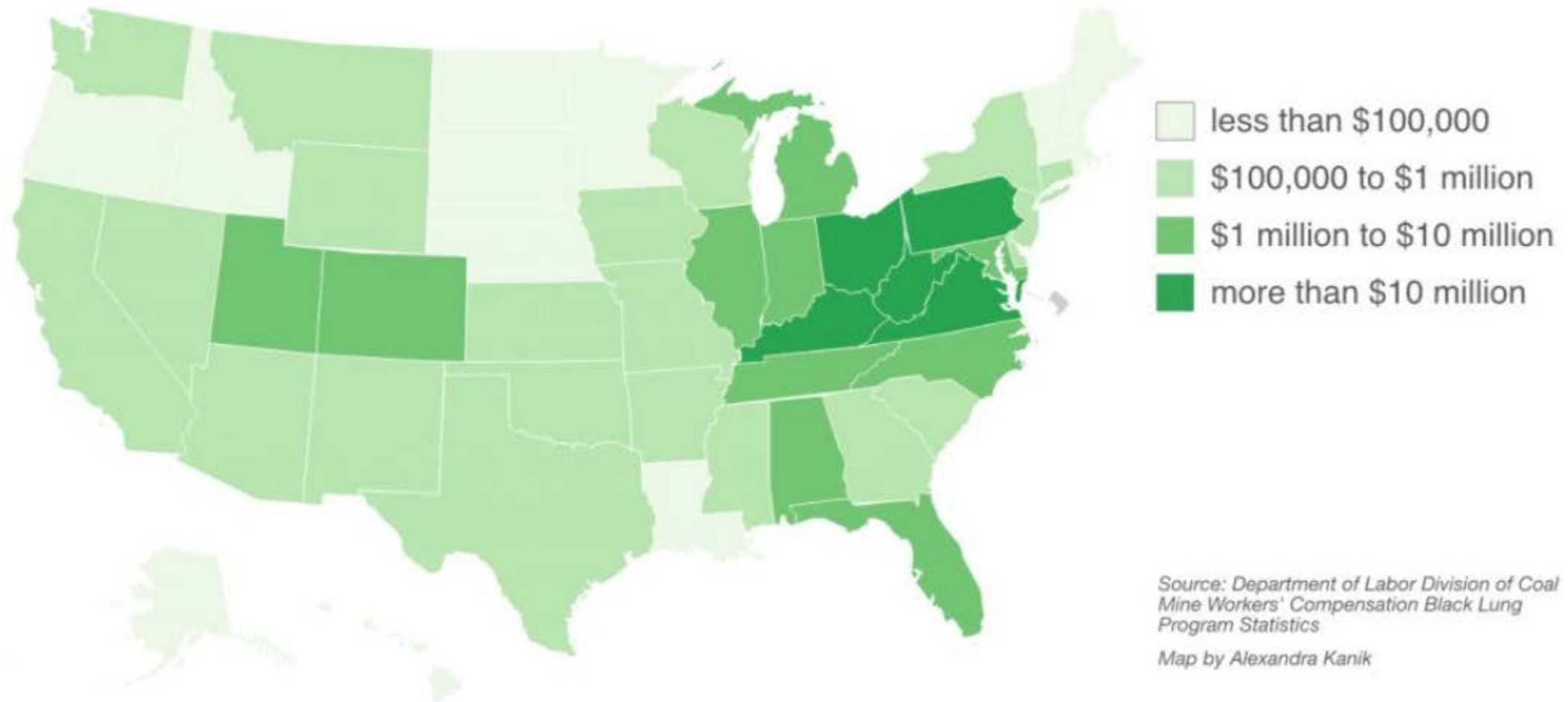
ORIGINAL RESEARCH

## Progressive Massive Fibrosis Resurgence Identified in U.S. Coal Miners Filing for Black Lung Benefits, 1970–2016


Kirsten S. AlMBERG<sup>1,2</sup>, Cara N. Halldin<sup>2</sup>, David J. Blackley<sup>2</sup>, A. Scott Laney<sup>2</sup>, Eileen Storey<sup>2</sup>, Cecile S. Rose<sup>3</sup>, Leonard H. T. Go<sup>1</sup>, and Robert A. Cohen<sup>1,2</sup>

# Black Lung Claims, by dollars paid

Disbursements of income and medical benefits for claims paid by the Black Lung Disabilities Trust Fund, and claims in interim pay status during 2015. Does not include benefits paid by liable coal mine operators and insurers.



# Continued increase in lung transplantation for coal workers' pneumoconiosis in the United States

David J. Blackley DrPH  | Cara N. Halldin PhD | A. Scott Laney PhD

Respiratory Health Division, National Institute for Occupational Safety and Health, Morgantown, West Virginia

**Correspondence**

David J. Blackley, DrPH, Respiratory Health Division, National Institute for Occupational Safety and Health, 1095 Willowdale Road, Mail Stop HG900.2, Morgantown, WV 26505.  
Email: dblackley@cdc.gov

**Funding information**

No funding

**Background:** Severe coal workers' pneumoconiosis (CWP) is increasingly common, and sometimes requires lung transplantation.

**Methods:** Using Organ Procurement and Transplantation Network data, we updated the trend for CWP-related lung transplants, described CWP patients who have been waitlisted but not transplanted, and characterized the primary payer of medical costs for CWP-related and other occupational lung disease transplants.

**Results:** There have been at least 62 CWP-related lung transplants; 49 (79%) occurred in the last decade. The rate of these procedures has also increased. Twenty-seven patients were waitlisted but did not receive a transplant. Compared to other occupational lung diseases, transplants for CWP were more likely to be paid for by public insurance.


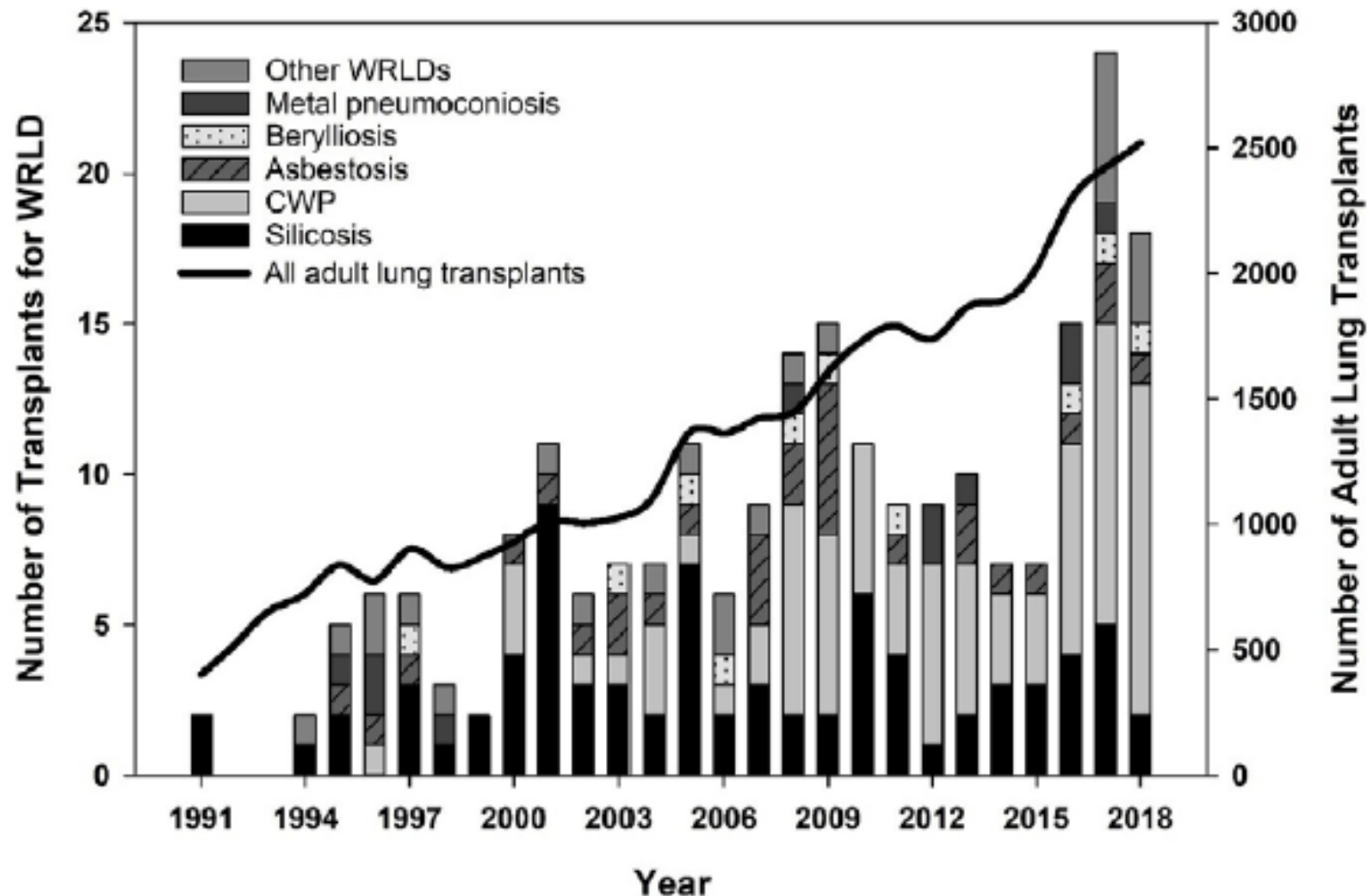
**Conclusions:** The increase in the frequency and rate of lung transplantation for CWP is consistent with the rising prevalence of severe CWP among U.S. coal miners. Effective exposure controls and identification of early stage CWP remain essential for protecting these workers.

**KEYWORDS**

coal workers' pneumoconiosis, lung transplantation, occupational lung disease, Organ Procurement and Transplantation Network

## ORIGINAL RESEARCH

## Transplantation for work-related lung disease in the USA

David J Blackley,<sup>1</sup> Cara N Halldin,<sup>1</sup> J W Awori Hayanga,<sup>2</sup> A Scott Laney <sup>1</sup>

**Figure 1** Frequency of lung transplantation in adult patients with work-related lung disease (WRLD) and overall, USA, 1991–2018. CWP, coal workers' pneumoconiosis.



RESEARCH ARTICLE

# Causes of death among Federal Black Lung Benefits Program beneficiaries enrolled in Medicare, 1999–2016

Laura Kurth PhD | Cara Halldin PhD | A. Scott Laney PhD |  
David J. Blackley DrPh

Respiratory Health Division, National  
Institute for Occupational Safety and Health,  
Centers for Disease Control and Prevention,  
Morgantown, West Virginia

**Correspondence**

Laura Kurth, PhD, Surveillance Branch,  
Respiratory Health Division, NIOSH/CDC  
1000 Frederick Ln, Mailstop HG900.2  
Morgantown, WV 26508.  
Email: lkurth@cdc.gov

**Funding information**

National Occupational Research Agenda,  
NIOSH, CDC

## Abstract

**Background:** Coal miners with totally disabling pneumoconiosis are eligible for benefits through the Federal Black Lung Benefits Program (FBLP). We identify the causes of death among Medicare beneficiaries with a claim for which the FBLP was the primary payer and compare these causes of death to all deceased Medicare beneficiaries to better understand elevated death and disease among miners with occupational respiratory exposures.

**Methods:** From 1999 to 2016 Medicare data, we extracted beneficiary and National Death Index data for 28,003 beneficiaries with an FBLP primary payer claim. We summarized the International Classification of Diseases, Clinical Modification 10th revision-coded underlying causes of death and entity-axis multiple causes of death for 22,242 deceased Medicare beneficiaries with an FBLP primary payer Medicare claim and compared their causes of death to the deceased Medicare beneficiary population.

**Results:** Among deceased FBLP beneficiaries, the three leading underlying causes of death were chronic obstructive pulmonary disease, unspecified (J44.9, 10.1%), atherosclerotic heart disease (I25.1, 9.3%), and coal workers' pneumoconiosis (CWP) (J60, 9.2%). All diseases of the respiratory system combined (J00–J99) were the underlying cause of death for 29.1% of all beneficiaries, with pneumoconioses (J60–J64) as the underlying cause for 11.0% of all beneficiaries.

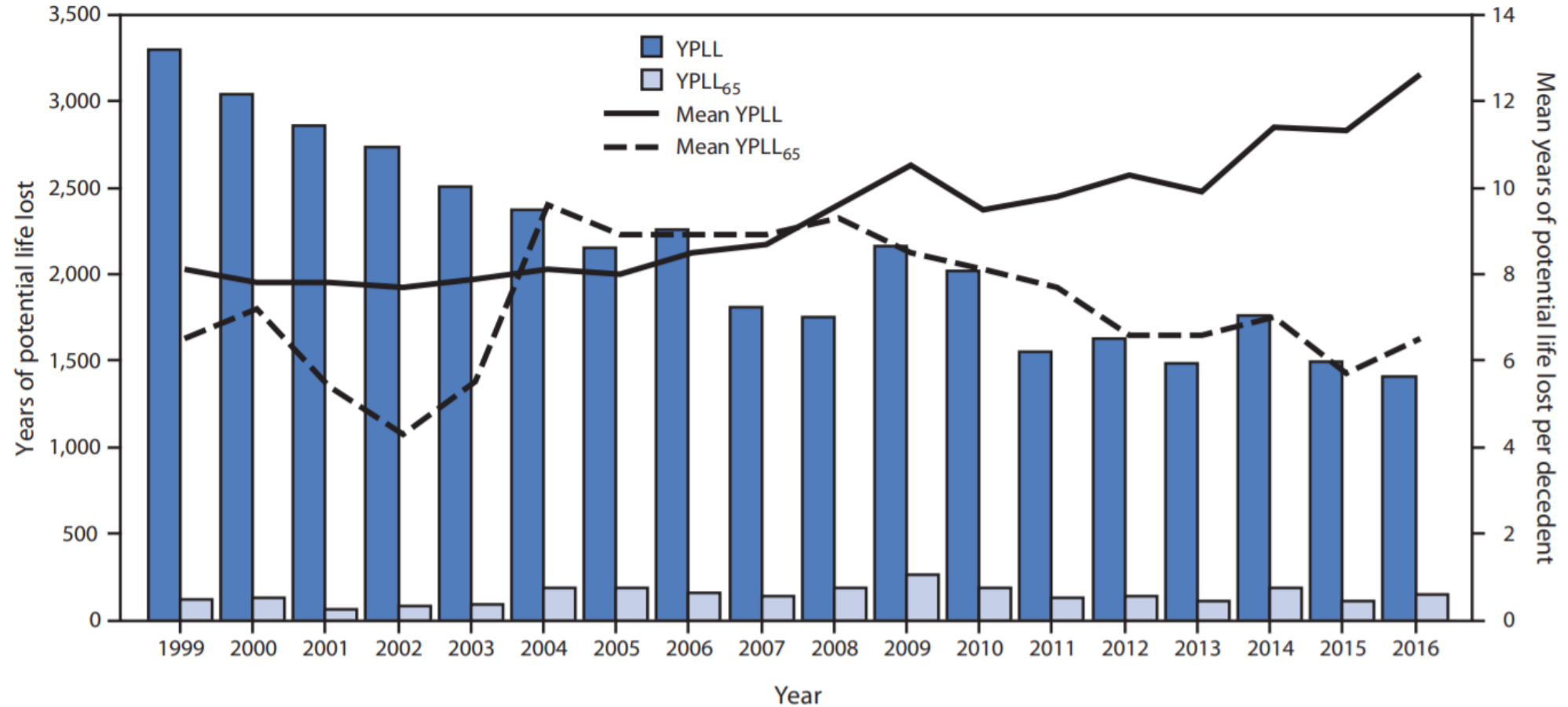
**Conclusions:** Coal miners enrolled in Medicare with an FBLP primary payer claim were more likely to have specific respiratory and cardiovascular diseases listed as a cause of death than deceased Medicare beneficiaries overall, and were also more likely to die from CWP or any pneumoconioses.

## KEYWORDS

compensation, lung disease, mortality, pneumoconiosis, surveillance



**FIGURE 2.** Years of potential life lost to life expectancy (YPLL) and before age 65 years (YPLL<sub>65</sub>) and mean YPLL and YPLL<sub>65</sub> per decedent for decedents aged ≥25 years with coal workers' pneumoconiosis,\* by year of death — United States, 1999–2016



**Source:** Multiple cause-of-death data, National Center for Health Statistics, CDC.

\* Decedents whose death certificates listed the *International Classification of Diseases, Tenth Revision* (ICD-10) code J60 (coal workers' pneumoconiosis) as the underlying cause of death.

# Clinic-Based Investigations



# Methods

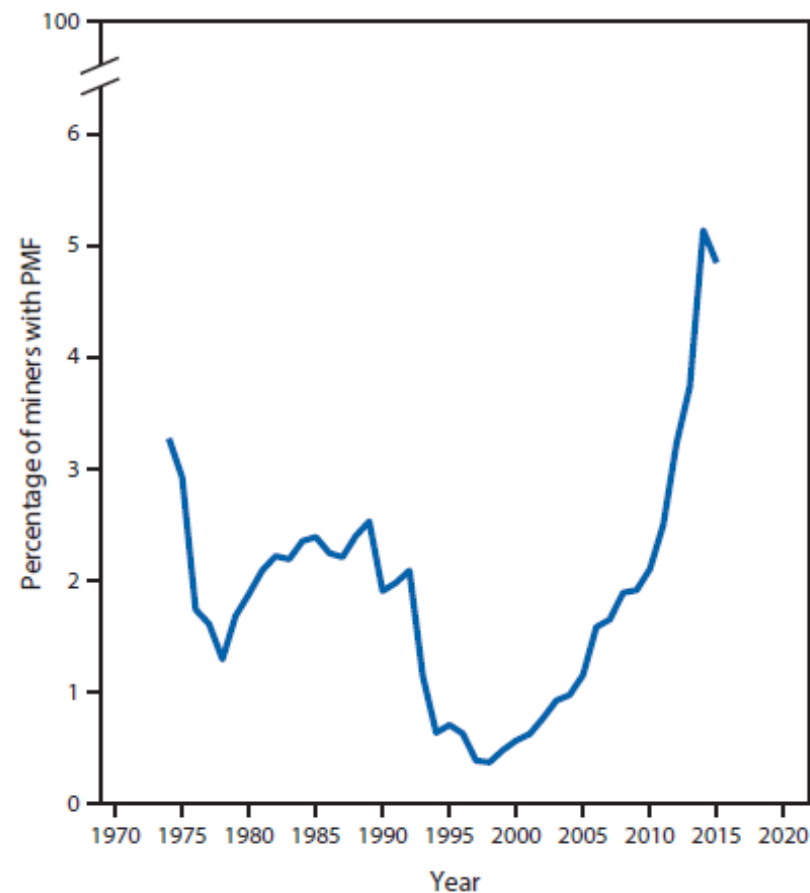
- Query electronic billing codes
- Review paper records
- Electronic and paper data abstraction
- Review and validation of radiographic findings



## Resurgence of Progressive Massive Fibrosis in Coal Miners — Eastern Kentucky, 2016

David J. Blackley, DrPH<sup>1</sup>; James B. Crum, DO<sup>2</sup>; Cara N. Halldin, PhD<sup>1</sup>; Eileen Storey, MD<sup>1</sup>; A. Scott Laney, PhD<sup>1</sup>

FIGURE 1. Prevalence of progressive massive fibrosis (PMF)\* among underground-working coal miners with  $\geq 25$  years of underground mining tenure — Coal Workers' Health Surveillance Program, Kentucky, Virginia, and West Virginia, 1974–2015



# Letters

## RESEARCH LETTER

### Progressive Massive Fibrosis in Coal Miners From 3 Clinics in Virginia

Since 1970, the Coal Workers' Health Surveillance Program (CWHSP), administered by the National Institute for Occupational Safety and Health, has offered periodic chest radiographs to working US coal miners.<sup>1</sup> The primary purpose of the CWHSP is early detection of coal workers' pneumoconiosis to prevent progression to disabling lung disease, including progressive massive fibrosis (PMF). By the late 1990s, PMF was rarely identified among miners participating in the CWHSP. However, a 2014 report documented an increase in the prevalence of PMF in Appalachia.<sup>2</sup> On February 1, 2017, the director of a network of 3 federally funded black lung clinics (which primarily serve former miners, and are not affiliated with the CWHSP) in Southwest Virginia requested assistance to determine the burden of PMF in patients served by the clinics.

**Discussion** | To our knowledge, this is the largest cluster of PMF reported in the scientific literature. A high proportion of these cases had r-type opacities, category B and C large opacities, and coal mining tenure of less than 20 years, which are indications of exceptionally severe and rapidly progressive disease. This report underestimates the total burden of PMF and other severe respiratory disease at these clinics because miners with

Table. Radiographic Findings and Characteristics Among 416 Coal Miners With Progressive Massive Fibrosis From 3 Clinics in Virginia, January 2013-February 2017

	No. of Coal Miners (%)
Large opacity pneumoconiosis, category <sup>a</sup>	
A	262 (63.0)
B	120 (28.8)
C	34 (8.2)
Age, mean (range), y <sup>b</sup>	61.8 (38.6-88.7)
White race <sup>b</sup>	381 (100) <sup>c</sup>
Men <sup>b</sup>	388 (100)
State of residence <sup>b</sup>	
Kentucky	157 (42.1)
Tennessee	10 (2.7)
Virginia	181 (48.5)
West Virginia	19 (5.1)
Other states <sup>d</sup>	6 (1.6)
Smoking status <sup>b</sup>	

# Letters

## RESEARCH LETTER

### Progressive Massive Fibrosis in Coal Miners From 3 Clinics in Virginia

Since 1970, the Coal Workers' Health Surveillance Program (CWHSP), administered by the National Institute for Occupational Safety and Health, has offered periodic chest radiographs to working US coal miners.<sup>1</sup> The primary purpose of the CWHSP is early detection of coal workers' pneumoconiosis to prevent progression to disabling lung disease, including progressive massive fibrosis (PMF). By the late 1990s, PMF was rarely identified among miners participating in the CWHSP. However, a 2014 report documented an increase in the prevalence of PMF in Appalachia.<sup>2</sup> On February 1, 2017, the director of a network of 3 federally funded black lung clinics (which primarily serve former miners, and are not affiliated with the CWHSP) in Southwest Virginia requested assistance to determine the burden of PMF in patients served by the clinics.

**Discussion** | To our knowledge, this is the largest cluster of PMF reported in the scientific literature. A high proportion of these cases had r-type opacities, category B and C large opacities, and coal mining tenure of less than 20 years, which are indications of exceptionally severe and rapidly progressive disease. This report underestimates the total burden of PMF and other severe respiratory disease at these clinics because miners with

Table. Radiographic Findings and Characteristics Among 416 Coal Miners With Progressive Massive Fibrosis From 3 Clinics in Virginia, January 2013-February 2017

	No. of Coal Miners (%)
Large opacity pneumoconiosis, category <sup>a</sup>	
A	262 (63.0)
B	120 (28.8)
C	34 (8.2)
Age, mean (range), y <sup>b</sup>	61.8 (38.6-88.7)
White race <sup>b</sup>	381 (100) <sup>c</sup>
Men <sup>b</sup>	388 (100)
State of residence <sup>b</sup>	
Kentucky	157 (42.1)
Tennessee	10 (2.7)
Virginia	181 (48.5)
West Virginia	19 (5.1)
Other states <sup>d</sup>	6 (1.6)
Smoking status <sup>b</sup>	

## Data Sources for Coal Workers' Pneumoconiosis

- NIOSH Coal Workers Health Surveillance Program (CWHSP)
- MSHA Part 50 Accident and Illness Reporting
- Medical Records at Healthcare Facilities
- Mandatory Reporting to State Health Department
- Department of Labor Division of Coal Mine Workers' Compensation (Federal Black Lung Program)
- State Compensation Programs
- CDC National Center for Health Statistics National Vital Statistics System Mortality Data
- National and Center-Based Lung Transplant Registries



## Current Review of Pneumoconiosis Among US Coal Miners

Noemi B. Hall<sup>1</sup> · David J. Blackley<sup>1</sup> · Cara N. Halldin<sup>1</sup> · A. Scott Laney<sup>1</sup>

© This is a U.S. Government work and not under copyright protection in the US; foreign copyright protection may apply 2019

### Abstract

**Purpose of Review** This review summarizes recent research on pneumoconiosis in coal workers following the identification of the resurgence of this disease among US coal miners in the early 2000s. We describe the impact of this research and how this has led to increased public attention, benefitting affected miners.

**Recent Findings** The latest research shows that the prevalence of pneumoconiosis, including progressive massive fibrosis, continues to increase, especially in central Appalachia. Contributing factors may include mining of thin coal seams or cutting rock to access coal, which may expose miners to coal mine dust with a higher content of silica and silicates than in the past.

**Summary** The impact of recently implemented changes, such as the reduced occupational exposure limit for respirable coal mine dust and the introduction of continuous personal dust monitors, will likely take years to appropriately evaluate.

**Keywords** Pneumoconiosis · Coal miners · Environmental health

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

