

Dust Management System Failures

Lessons from the Australia and the US – Why we still have Black Lung Disease in Coal Mine Workers in the 21st Century

Global Cut the Dust Conference
Goal Coast, Queensland, Feb 2020

Robert Cohen, MD, FCCP
Honorary Professor University
of Queensland, SMI



Clinical Professor - EOHS,
University of Illinois
School of Public Health
Chicago, Illinois

Professor of Medicine
Northwestern University
Feinberg School of Medicine

Senior Consultant NIOSH
Respiratory Health Division

Disclosure of Financial Support

- ▶ Funded by the Alpha Foundation for the Improvement of Mine Safety and Health, Inc.
- ▶ Funded by HHS/HRSA/ORHP/BLCP & BLCE
- ▶ Senior Consultant NIOSH/RHD
- ▶ Funded by USDOL/OWCP & MSHA
- ▶ Funded by Queensland Government, Australia


UIC Environmental and Occupational
UNIVERSITY OF ILLINOIS
AT CHICAGO Health Sciences Division
SCHOOL OF PUBLIC HEALTH

National Institute for
Occupational Safety and Health
NIOSH



Objectives

- Describe the failures of the public health systems in the US and in Australia resulting in resurgent black lung
 - US – Success – 1970-1990's
 - US – Failures – 1990's to present
 - Australian system
 - Prior to 1984
 - 1984-2015
 - 2015 to present



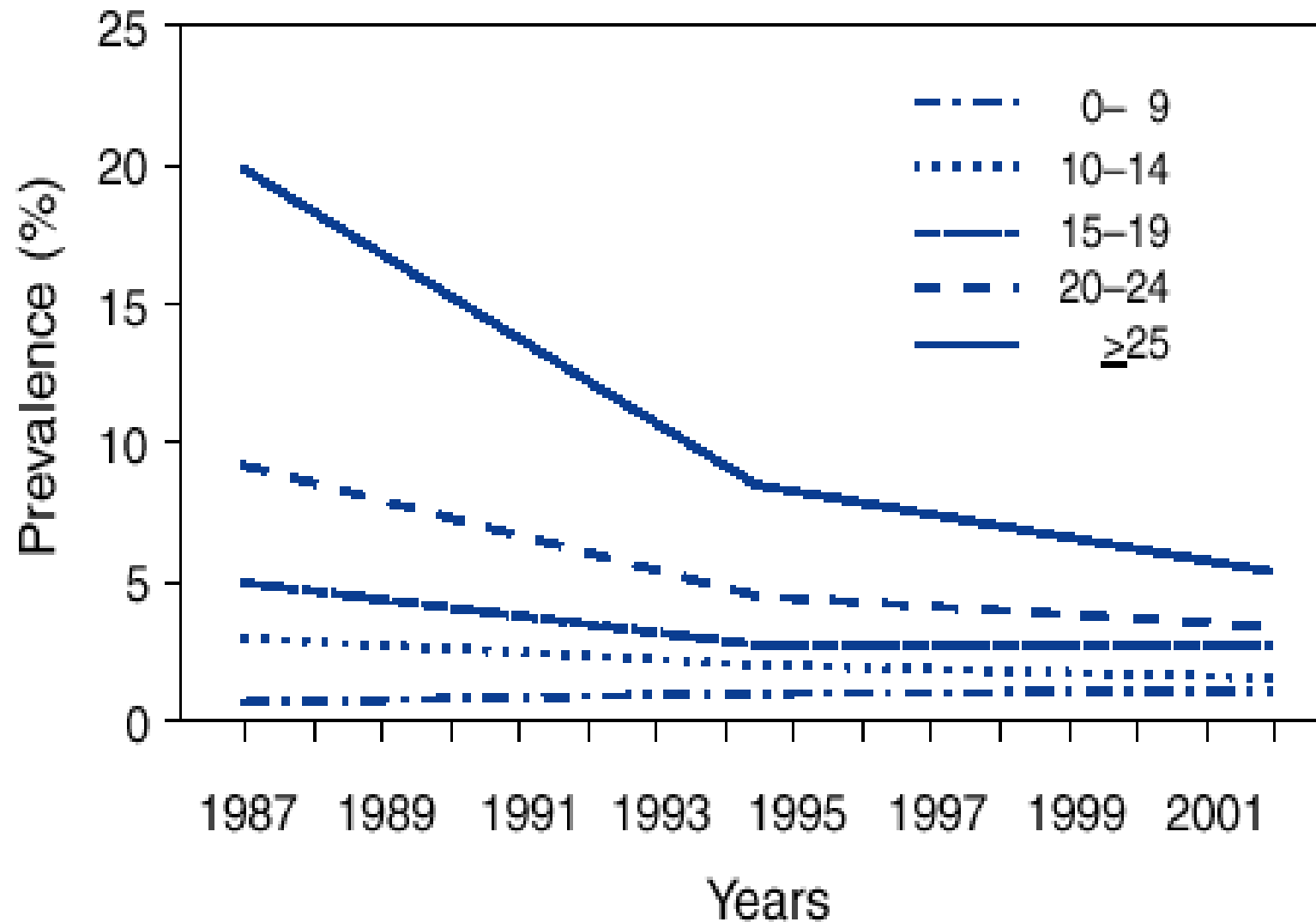
Federal Coal Mine Health and Safety Act of 1969

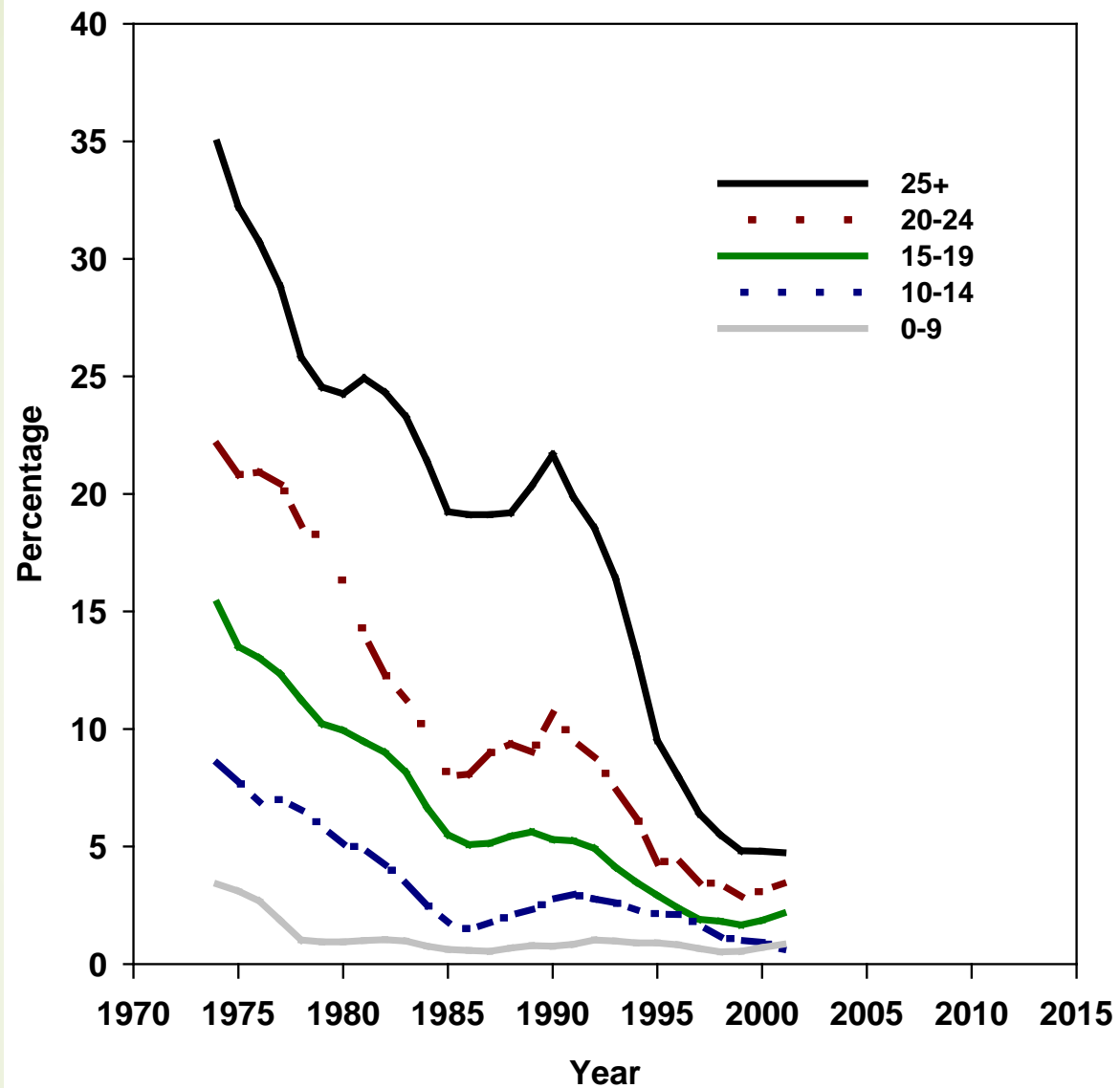
Congress mandated that respirable coal mine dust exposures be reduced to a level “...which will prevent new incidences of respiratory disease and the further development of such disease in any person.”

Federal Mine Safety and Health Act of 1977

The Secretary...shall...assure on the best available evidence that no miner will suffer material impairment of health or functional capacity even if such miner has regular exposure to the hazards dealt with by such standard for the period of his working life.

FIGURE 2. Trends in coal workers' pneumoconiosis prevalence by tenure among examinees employed at underground coal mines — U.S. National Coal Workers' X-Ray Surveillance Program, 1987–2002





Prevalence Coal Workers' Pneumoconiosis among coal miners, by underground mining tenure —United States

Black Lung Resurgence in the US

- Doubling of tenure-adjusted CWP (radiologic pneumoconiosis) prevalence from 1990 to 2008
- Increasing CWP mortality (Years of potential life lost)
- Severe CWP cases among young miners who worked exclusively under current dust exposure limits
- Rapidly progressive CWP
- Resurgent PMF

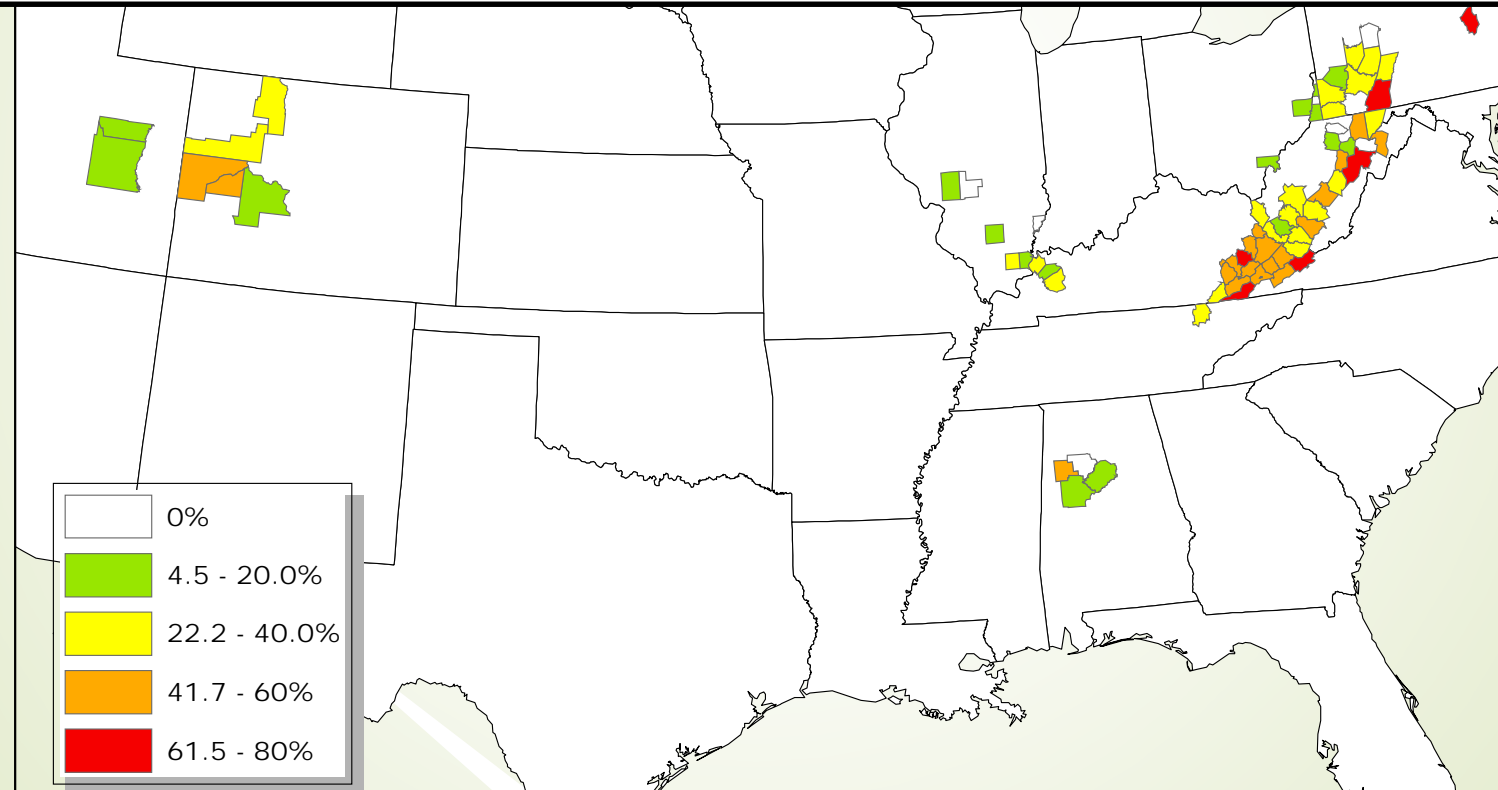


ORIGINAL ARTICLE

Rapidly progressive coal workers' pneumoconiosis in the United States: geographic clustering and other factors

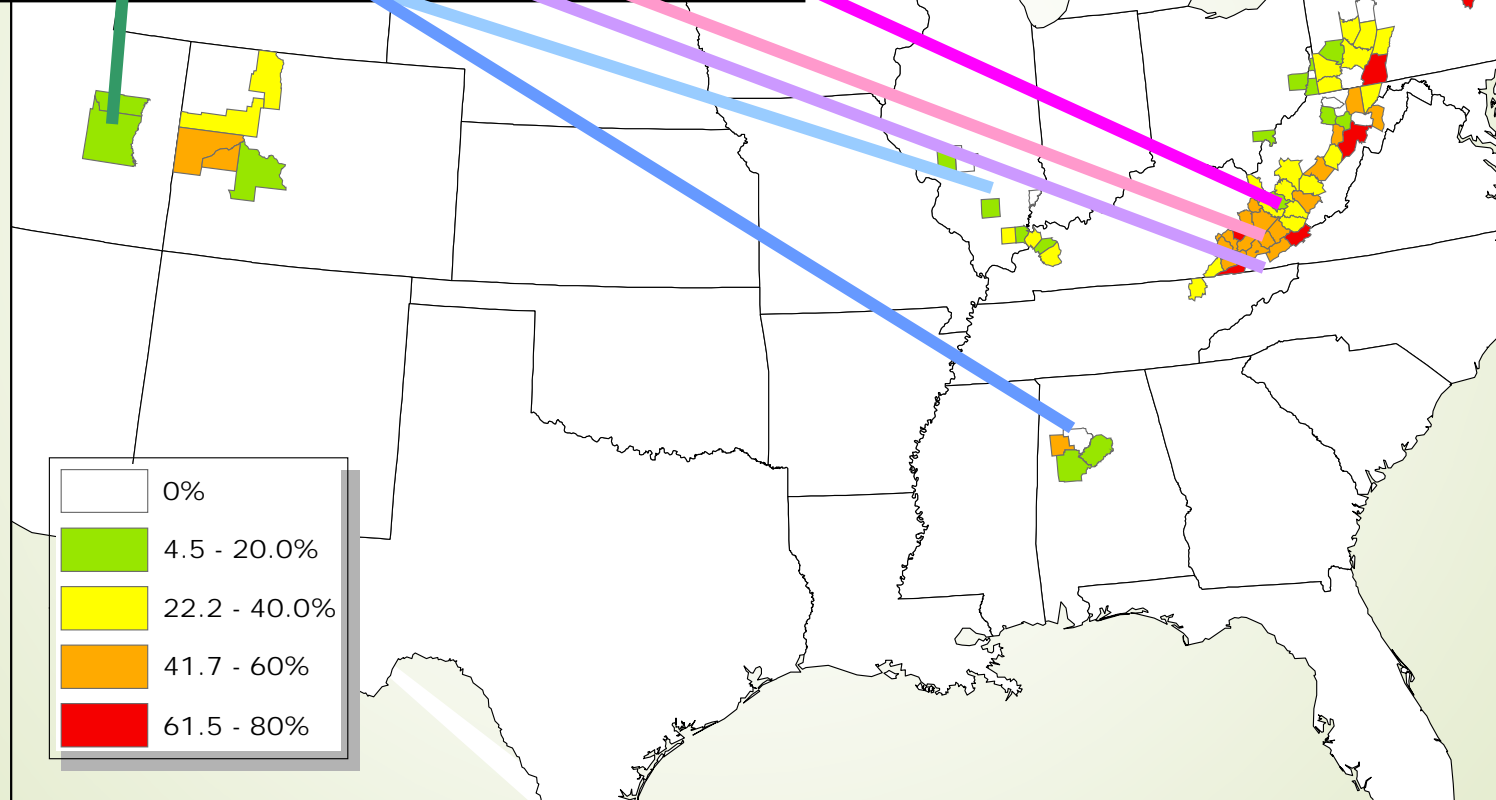
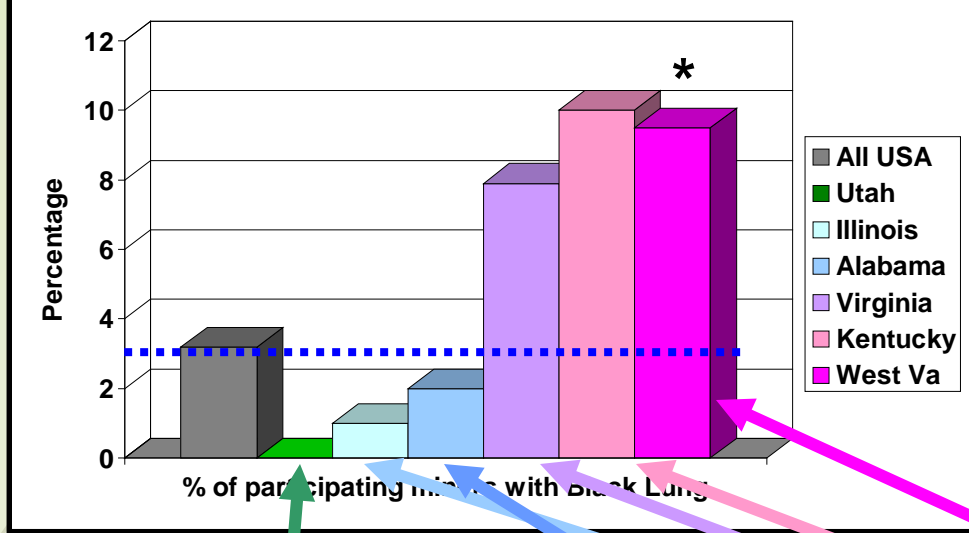
V C dos S Antao, E L Petsonk, L Z Sokolow, A L Wolfe, G A Pinheiro, J M Hale, M D Attfield

Occup Environ Med 2005;62:670-674. doi: 10.1136/oem.2004.019679



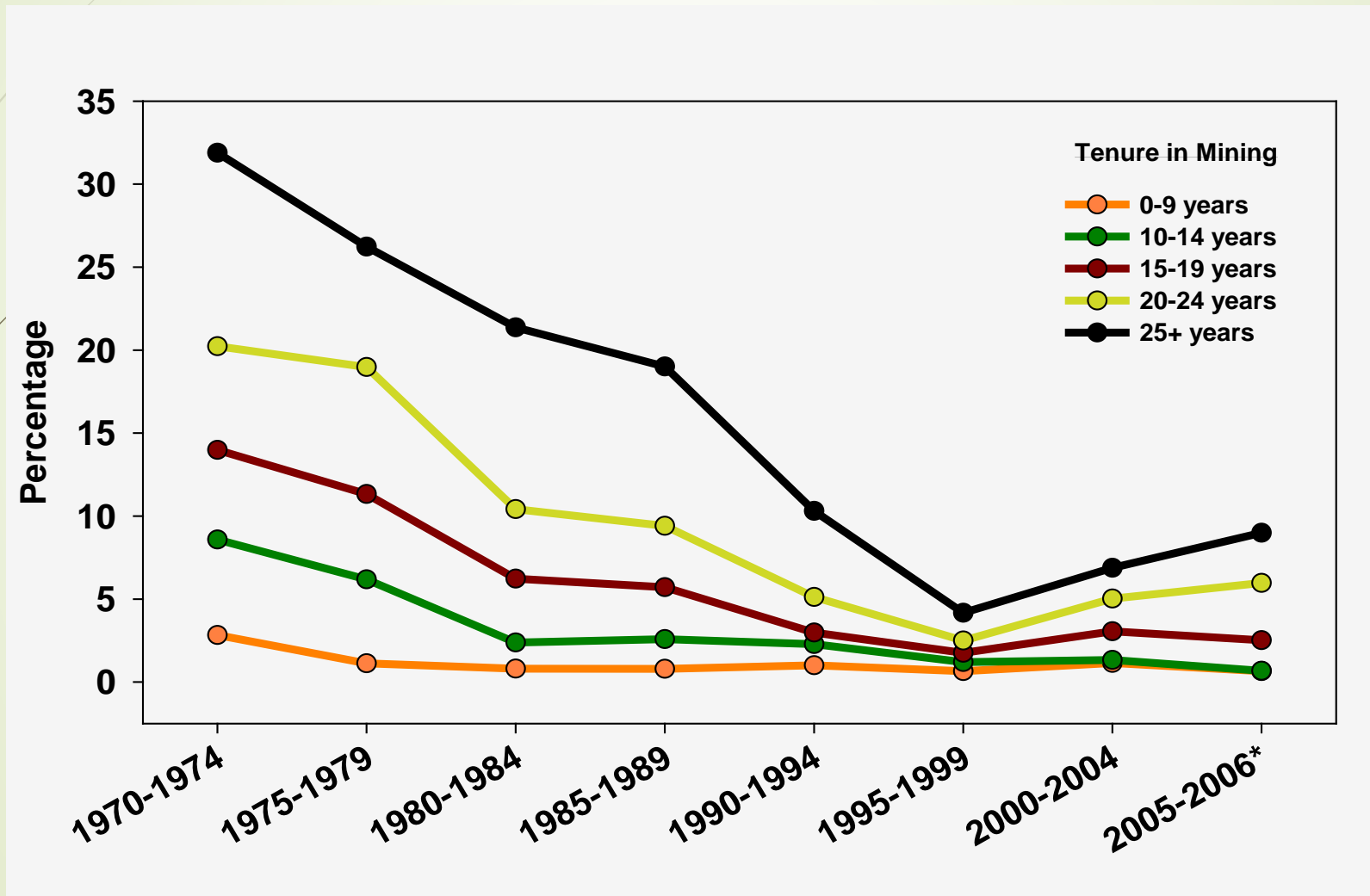
* Results from NIOSH Coal Workers' Health Surveillance Program, 1996-2002
Not shown are counties with fewer than 5 miners evaluated

"Hot Spots" to Miners 2006-07



* preliminary

Percent of miners with Coal Workers' Pneumoconiosis (CWP) by tenure in mining, 1970-2006



SOURCE: NIOSH Coal Workers' X-ray Surveillance Program (CWXP) as cited in NIOSH 2007 WoRLD Report, Figure 2-4.

Upper Big Branch Mine - April 5, 2010





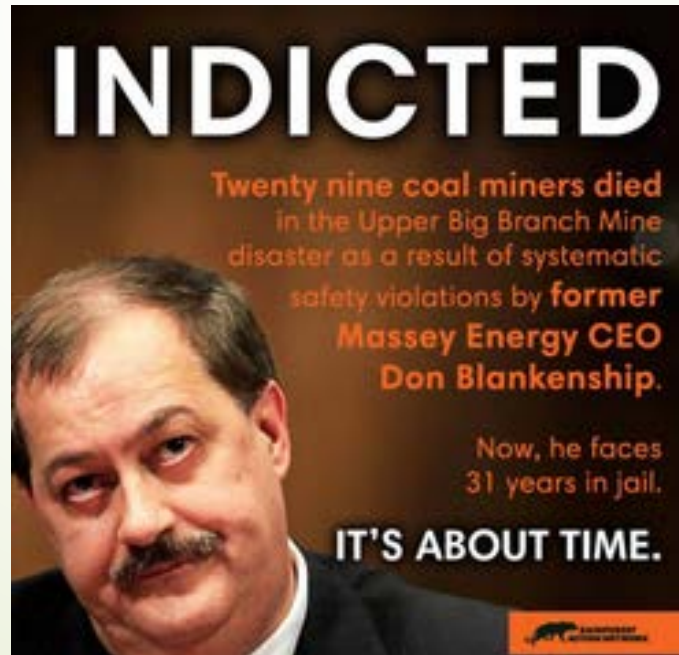
Upper Big Branch, April 5, 2010

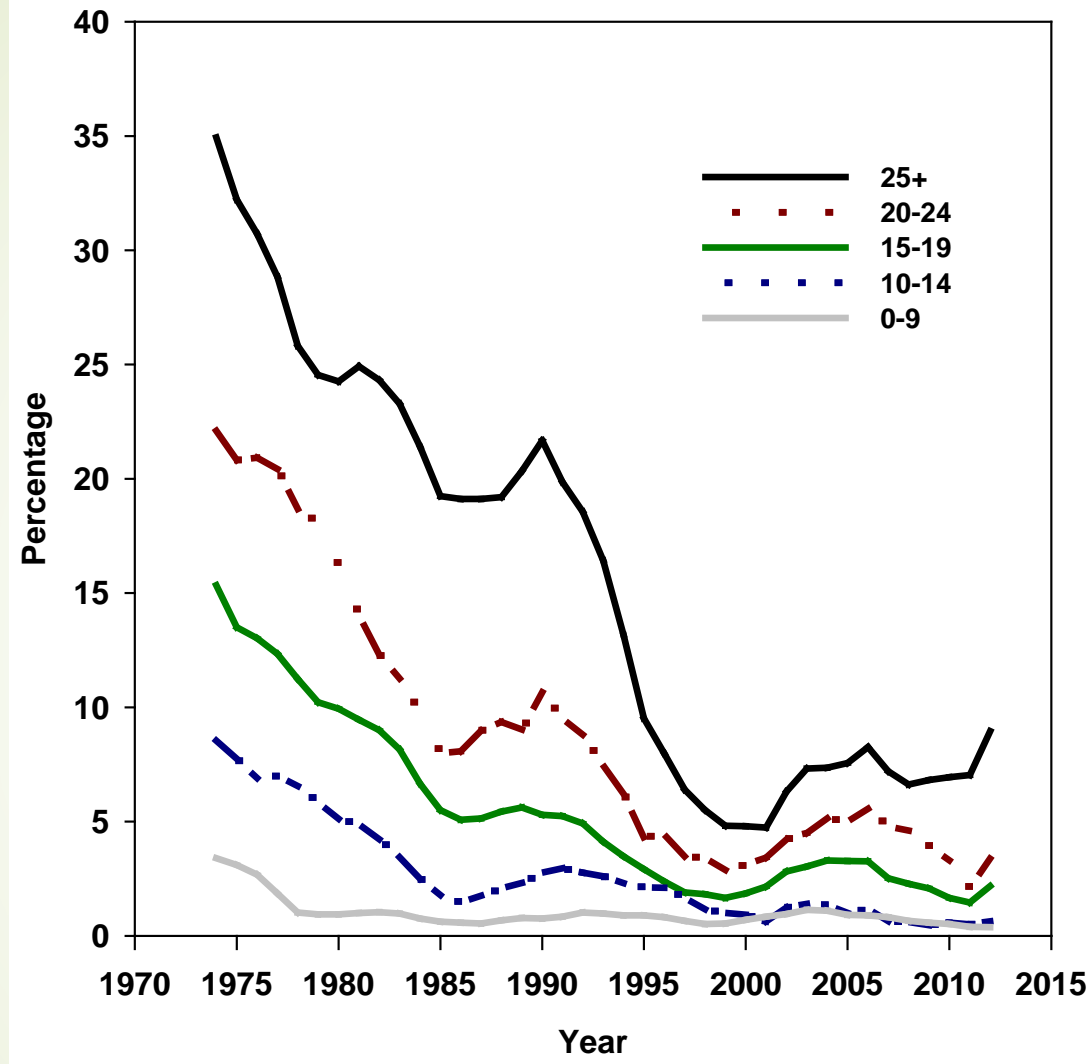
- Fire and Explosion Killed 29 Miners
- Analysis of the pattern of injuries from the Upper Big Branch Disaster showed 10 deaths from CO
- The remainder primarily due to blast and thermal injuries
- A systematic pathologic review suggests a continuing high proportion had pneumoconiosis 86%
- Settlement of law suit resulting from the disaster resulted in the formation of the Alpha Foundation which is funding part of our work

The Coal Baron on Trial in Appalachia

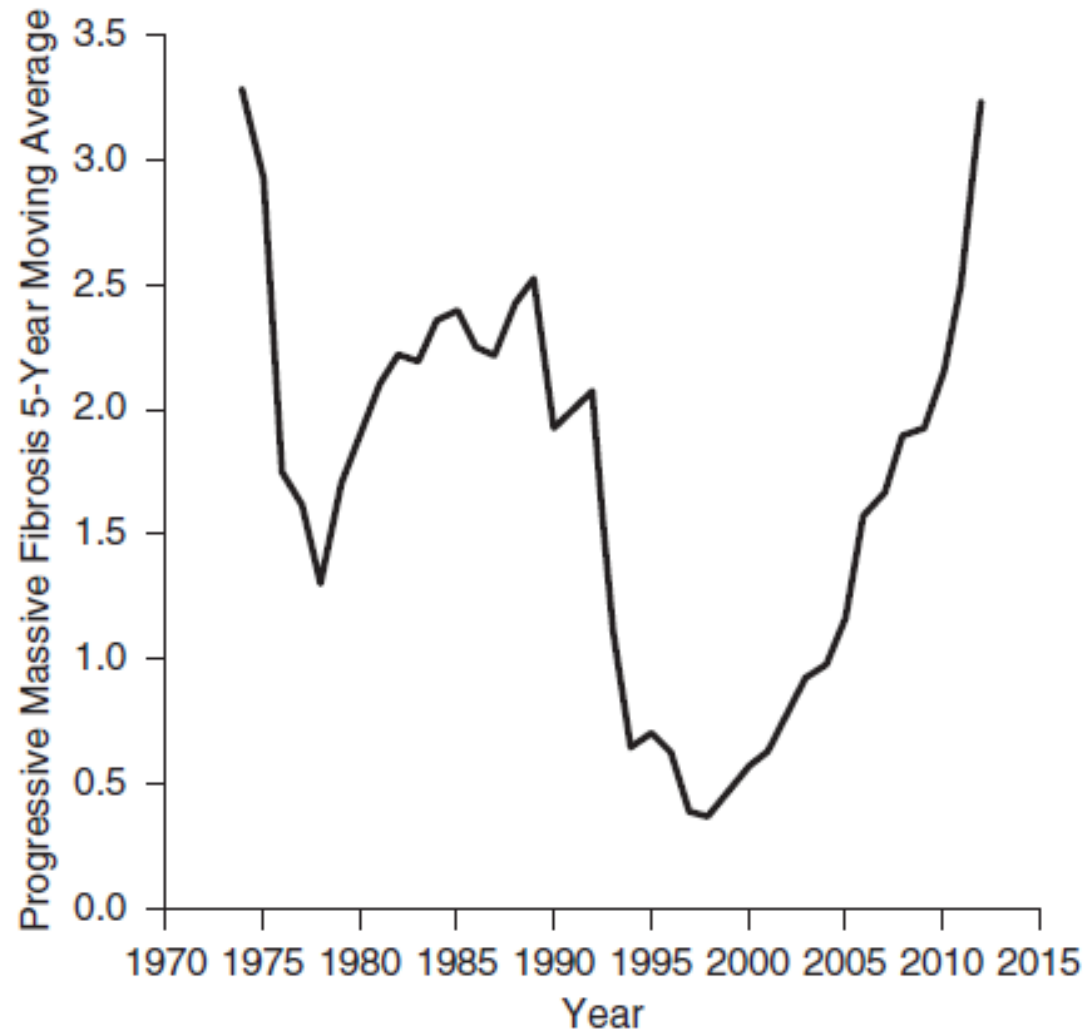
By **THE EDITORIAL BOARD** OCT. 30, 2015

“Run coal!” was the signature command Donald Blankenship issued to underlings when he reigned as the fearsome baron of Big Coal in the mines of Appalachia. His mantra of profits above all else is at the core of the current criminal trial of Mr. Blankenship on charges of conspiring to violate health and safety laws, and scheming to foil mine investigators in connection with the Upper Big Branch mine explosion that killed 29 coal miners more than five years ago in Raleigh County, W.Va.





Prevalence of CWP, by mining tenure, in United States from 1974 to 2012



Blackley DJ, Halldin CN, Laney AS.
Resurgence of a debilitating and entirely preventable respiratory disease among working coal miners.

Am J Respir Crit Care Med.

2014;190(6):708-709.

doi:10.1164/rccm.20

1407-1286LE.

Prevalence of progressive massive fibrosis (PMF) among working underground coal miners with at least 25 years of underground mining tenure in KY, VA, and WV

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

David J. Blackley, DrPH¹; James B. Crum, DO²; Cara N. Halldin, PhD¹; Eileen Storey, MD¹; A. Scott Laney, PhD¹

- ▶ 1/1/15–8/17/16, a total of 60 patients with PMF
- ▶ 49 had their radiograph taken during 2016.
- ▶ Surveillance data have indicated a resurgence of PMF in recent years, but the cases described in this report represent a large cluster not discovered through routine surveillance.



SPECIAL SERIES

black lung returns to coal country



7:45

+ Queue

Download

Embed

Transcript

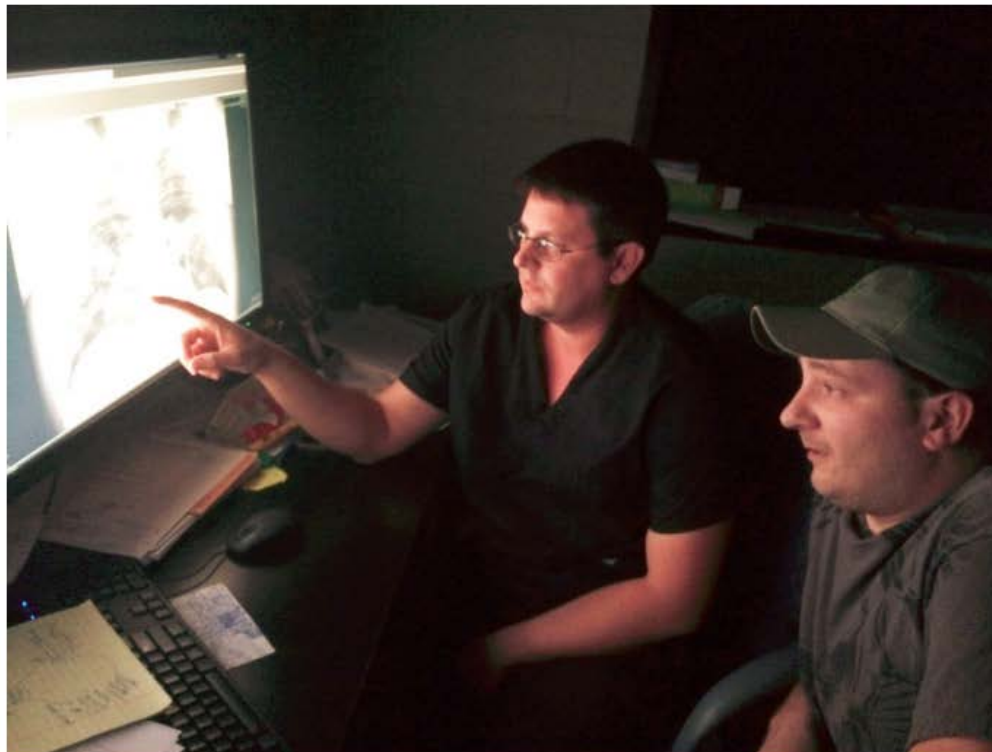


Advanced Black Lung Cases Surge In Appalachia

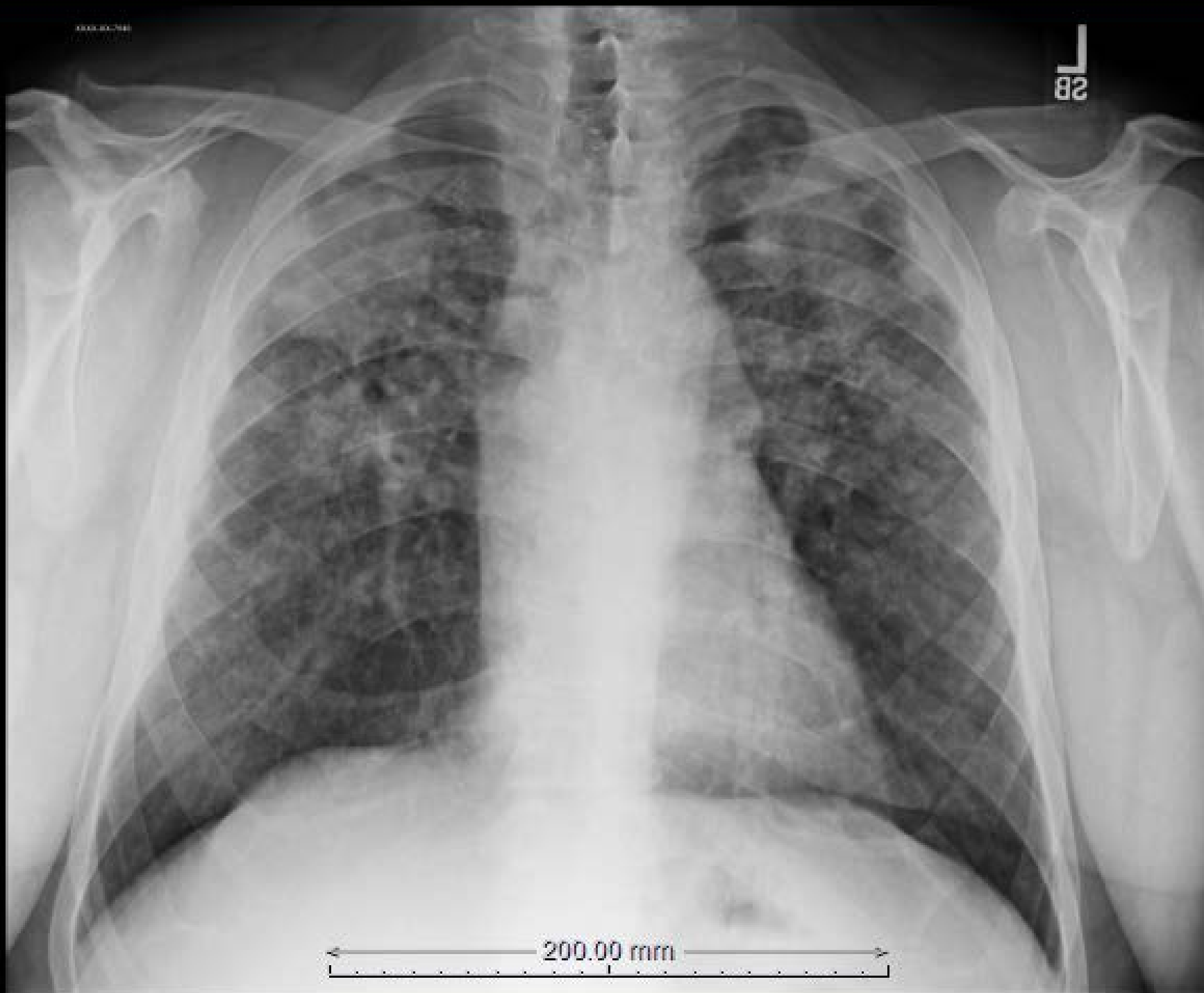
December 15, 2016 - 6:13 PM ET
Heard on All Things Considered



HOWARD BERKES



Radiologist Brandon Crum and former coal miner Mackie Branham, 39, view an X-ray of Branham's diseased lung at Crum's black lung clinic in Coal Run Village, Ky.



Black Lung Study Finds Biggest Cluster Ever Of Fatal Coal Miners' Disease

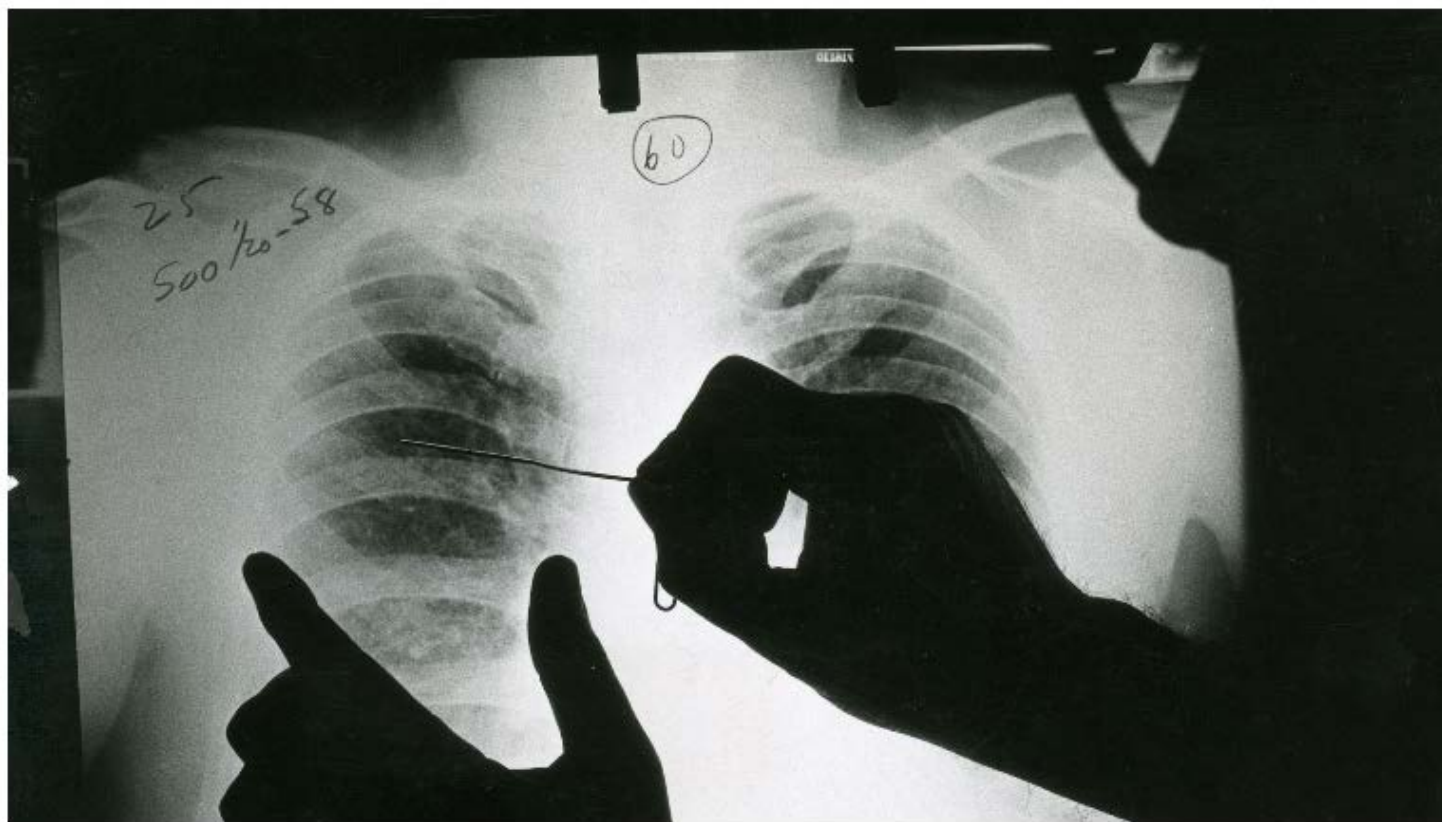
February 6, 2018 · 11:01 AM ET
Heard on All Things Considered



HOWARD BERKES



ADELINA LANCIANESE



In this historical image, a doctor reviews an X-ray of a patient with black lung disease. Federal researchers say they've now identified the largest cluster ever recorded of the most advanced stage of the disease.

Michael Sullivan/Getty Images/Science Source

416 Case of PMF from 3 Clinics

JAMA[®], the Journal of the American Medical Association

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.¹ The primary purpose of the CWHSP is early detection of coal workers' pneumoconiosis to

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 ^a	
A	262 (63.0)
B	120 (28.8)
C	34 (8.2)

Blackley et. al. JAMA 319:5 p. 500-501

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

 Kirsten S Almberg ; Cara N. Halldin , David J. Blackley , A. Scott Laney , Eileen Storey , Cecile S Rose , Leonard H. T. Go , and  Robert A Cohen ;

+ Author Information

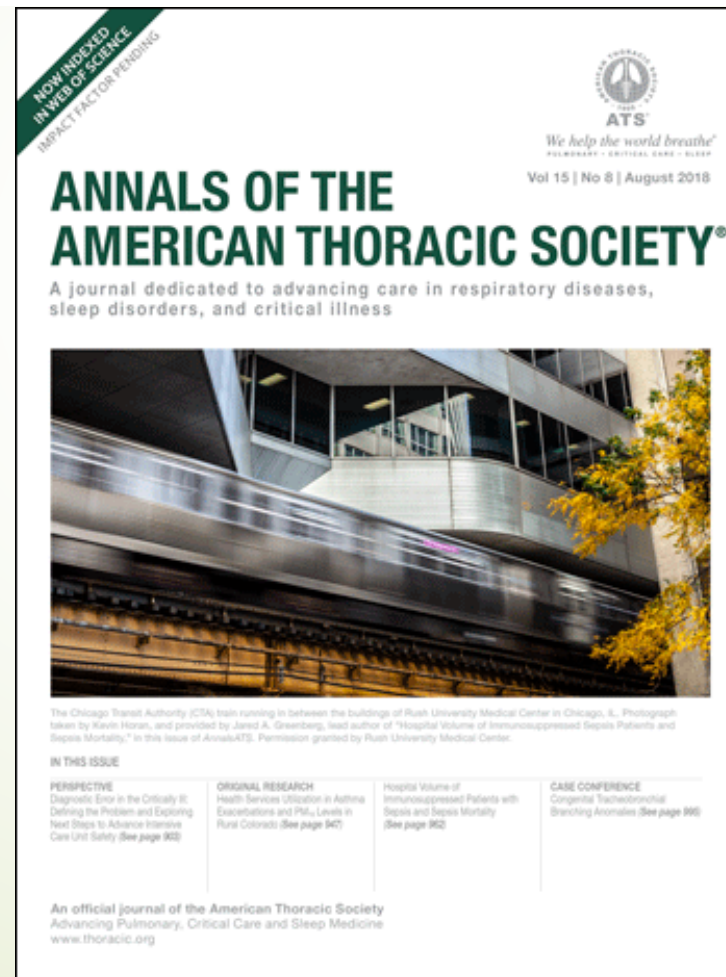
<https://doi.org/10.1513/AnnalsATS.201804-261OC>

PubMed: [30114941](https://pubmed.ncbi.nlm.nih.gov/30114941/)

Received: April 19, 2018

Accepted: July 25, 2018

Published Online: August 17, 2018



ANNALS OF THE AMERICAN THORACIC SOCIETY®
A journal dedicated to advancing care in respiratory diseases, sleep disorders, and critical illness

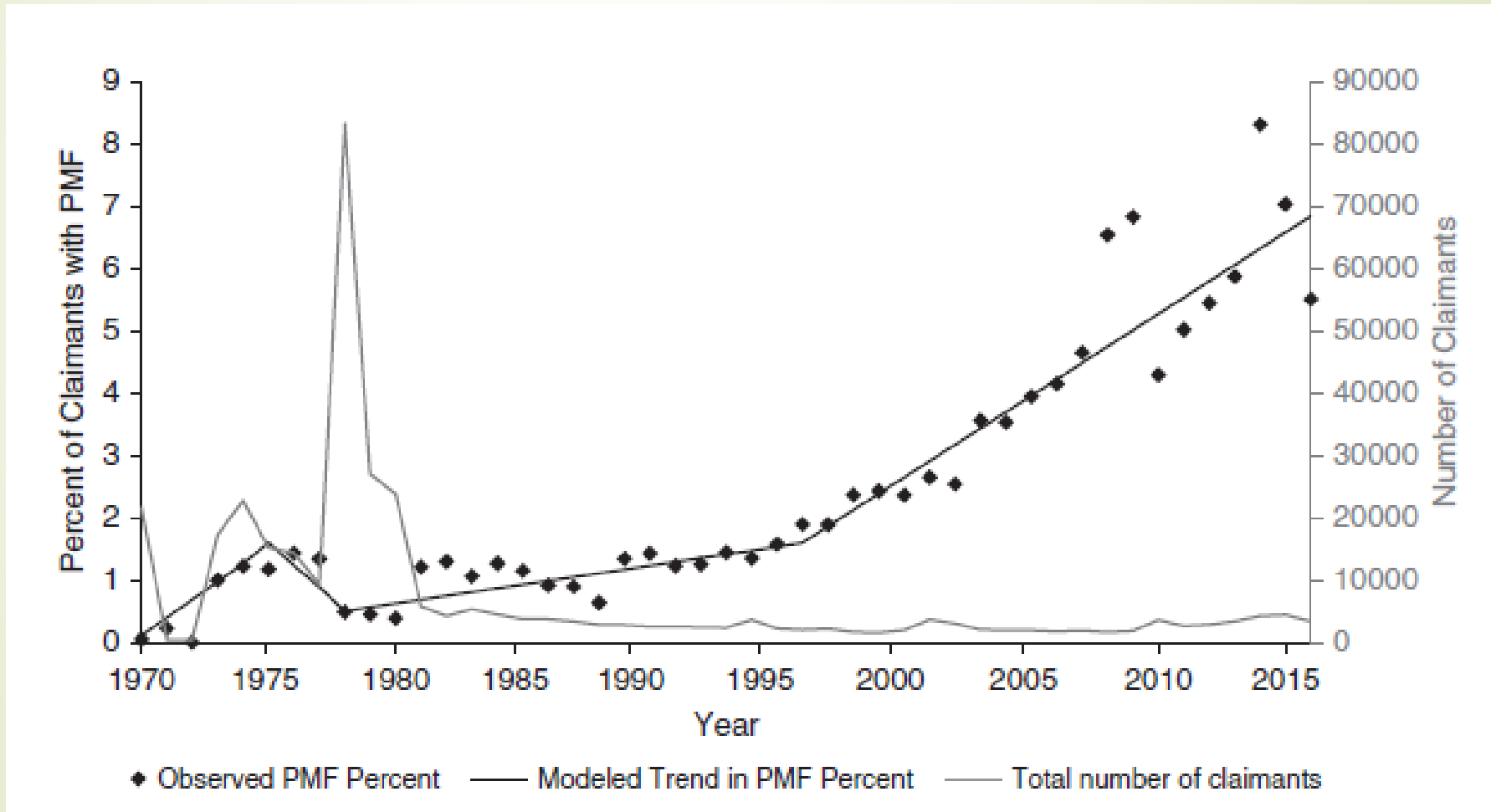
Vol 15 | No 8 | August 2018


IN THIS ISSUE

PERSPECTIVE Diagnostic Error in the Critically Ill: Defining the Problem and Exploring Next Steps to Advance Intensive Care Unit Safety (See page 902)	ORIGINAL RESEARCH Health Services Utilization in Asthma Exacerbations and PNE, Levels in Rural Colorado (See page 947)	Hospital Volume of Immunosuppressed Patients with Sepsis and Sepsis Mortality (See page 952)	CASE CONFERENCE Congenital Tracheobronchial Branching Anomalies (See page 960)
--	--	---	--

An official journal of the American Thoracic Society
Advancing Pulmonary, Critical Care and Sleep Medicine
www.thoracic.org

Proportion of PMF Claims in DOL BLBP – 1970-2016





PMF cases found in retired miners who never participated in NIOSH CWHSP. Why don't miners participate?

- ▶ Holes in the social safety net:
- ▶ 1985 – 2005, employment in the Appalachia coal mining industry declined by 56% due to
 - ▶ Cost of coal relative to oil and natural gas
 - ▶ Increased mechanization
 - ▶ Shift to contract labor
- ▶ Fear of job loss
- ▶ Fear of disease and associated disability
- ▶ Mistrust of government



Coal Workers' Health Surveillance Program and Black Lung Benefits Program

- ▶ CWHSP

- ▶ Available to all **active** miners, but participation is voluntary

- ▶ BLBP

- ▶ Former Miners
 - ▶ Data collected by the U.S. DOL DCMWC in claims adjudication process
 - ▶ Included all claims from 2000 to 2013

Linkage Results

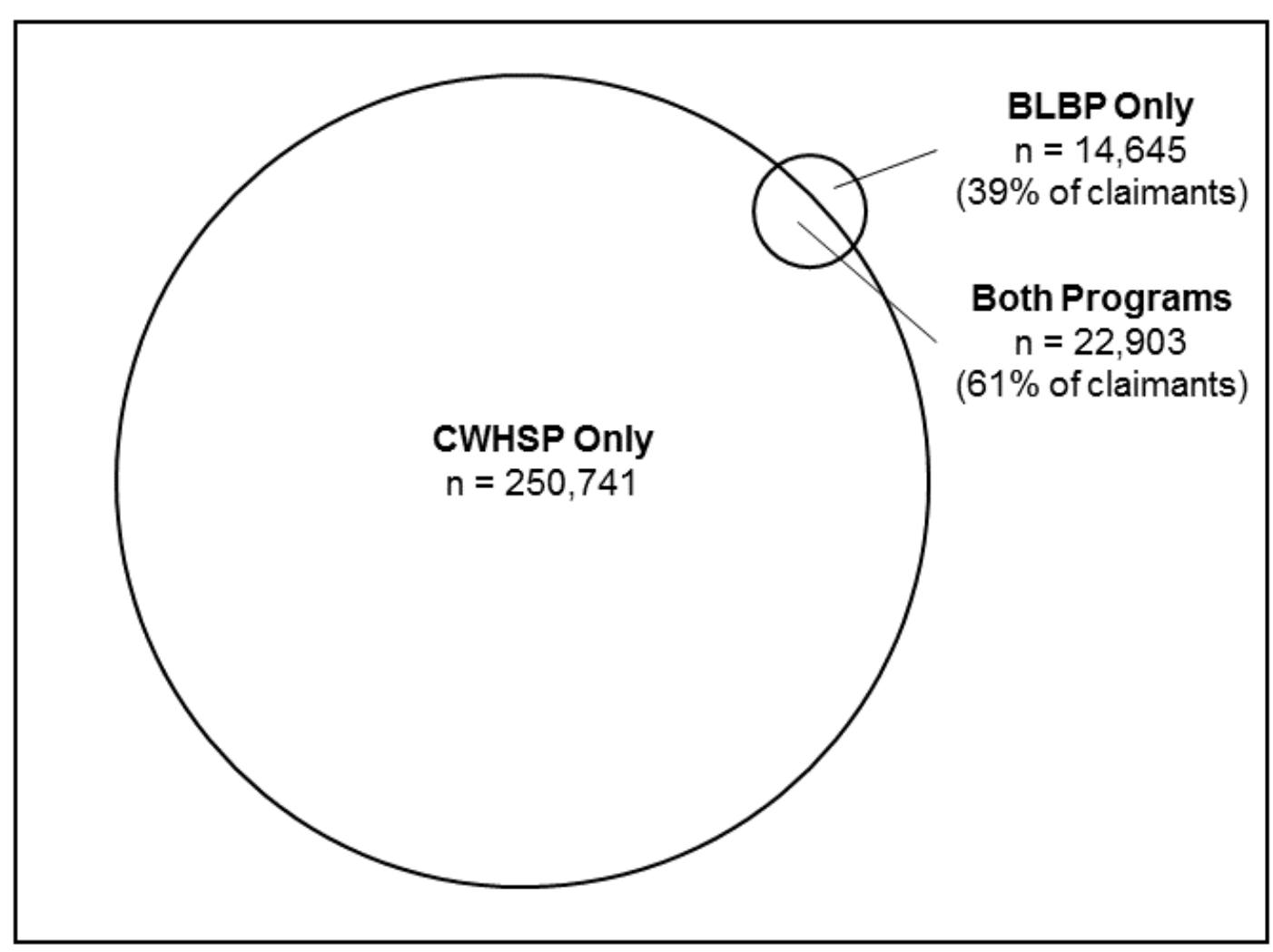


Figure 1. Venn diagram of the overlap between participants in the NIOSH Coal Workers' Health Surveillance Program (CWHSP) (N = 273,644) and the Department of Labor's Black Lung Benefits Program (BLBP) (N = 37,548), 1970 – 2013.

Advanced Pneumoconiosis

Why?

- ▶ Are dust control plans adequate?
- ▶ Do enforcement dust samples indicate the miner's actual exposures?



Advanced Pneumoconiosis - Why?



Continuous miner - Paramount
Pound, VA

Silica from
cutting roof?

Silica dust is 20 times more toxic than coal

Freshly fractured dusts are more toxic

Advanced Pneumoconiosis - Why?

- Fewer miners but more coal
 - More productive equipment
 - Smaller particles ?
- Longer shifts and extended work weeks
 - Increase inhaled dust
 - Reduce time between shifts to clear dust from lungs
- Enough time for dust to clear from lungs?





2016 New MSHA Dust Rule

- ▶ Miners often worked longer than 8 hour shifts; old rule sampled only 8 hours
 - ▶ New rule requires sampling for entire shift
- ▶ Miners are exposed every working shift; only 5 shifts are sampled; samples are “averaged” to determine exposure
 - ▶ New rule measures exposure each shift



Changes with New Rule

- ▶ Samples currently may be taken at reduced levels of production
 - ▶ New rule requires sampling at average of last 30 production shifts
- ▶ Miners are getting disease at current standard
 - ▶ New rule has 1.5 mg/m³ PEL
- ▶ Miners are not provided sufficient information about their health and exposures
 - ▶ New rule allows use of CPDM and additional medical monitoring would provide miners information on which to act

EDITOR'S
CHOICE

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

Correspondence to

A Scott Laney, Surveillance Branch, Division of Respiratory Disease Studies, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, 1095 Willowdale Road, Mail Stop HG900.2, Morgantown, W V 26505–2888, USA; alaney@cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of The National Institutes for Occupational Safety and Health.

Accepted 19 July 2009
Published Online First
22 September 2009

Pneumoconiosis among underground bituminous coal miners in the United States: is silicosis becoming more frequent?

A Scott Laney, Edward L Petsonk, Michael D Attfield

ABSTRACT

Objectives Epidemiological reports since 2000 have documented increased prevalence and rapid progression of pneumoconiosis among underground coal miners in the United States. To investigate a possible role of silica exposure in the increase, we examined chest x-rays (CXRs) for specific abnormalities (r-type small opacities) known to be associated with silicosis lung pathology.

Methods Underground coal miners are offered CXRs every 5 years. Abnormalities consistent with pneumoconiosis are recorded by National Institute for Occupational Safety and Health (NIOSH) B Readers using the International Labour Organization Classification of Radiographs of Pneumoconioses. CXRs from 1980 to 2008 of 90973 participating miners were studied, focussing on reporting of r-type opacities (small rounded opacities 3–10 mm in diameter). Log binomial regression was used to calculate prevalence ratios adjusted for miner age and profusion category.

Results Among miners from Kentucky, Virginia and West Virginia, the proportion of radiographs showing r-type opacities increased during the 1990s (prevalence ratio (PR) 2.5; 95% CI 1.7 to 3.7) and after 1999 (PR 4.1; 95% CI 3.0 to 5.6), compared to the 1980s (adjusted for profusion category and miner age). The prevalence of

What this paper adds

- ▶ Epidemiologic reports since 2000 have documented increased prevalence and rapid progression of pneumoconiosis among underground coal miners in the United States.
- ▶ This study found an increase in a specific type of radiographic abnormality that has been shown to be associated with silicosis lung pathology.
- ▶ The increasing prevalence of r-type opacities, and greater number of cases of severe disease found in this study within the Appalachian coal fields point to excessive exposures to crystalline silica, a long recognized cause of rapid disease progression and severe pneumoconiosis in coal miners.
- ▶ These findings stress the need for a timely, comprehensive, accurate, and ongoing evaluation of crystalline silica exposures and control strategies in underground coal mines throughout the United States.



Pneumoconiosis among underground bituminous coal miners in the United States: is silicosis becoming more frequent?

A Scott Laney, Edward L Petsonk, Michael D Attfield

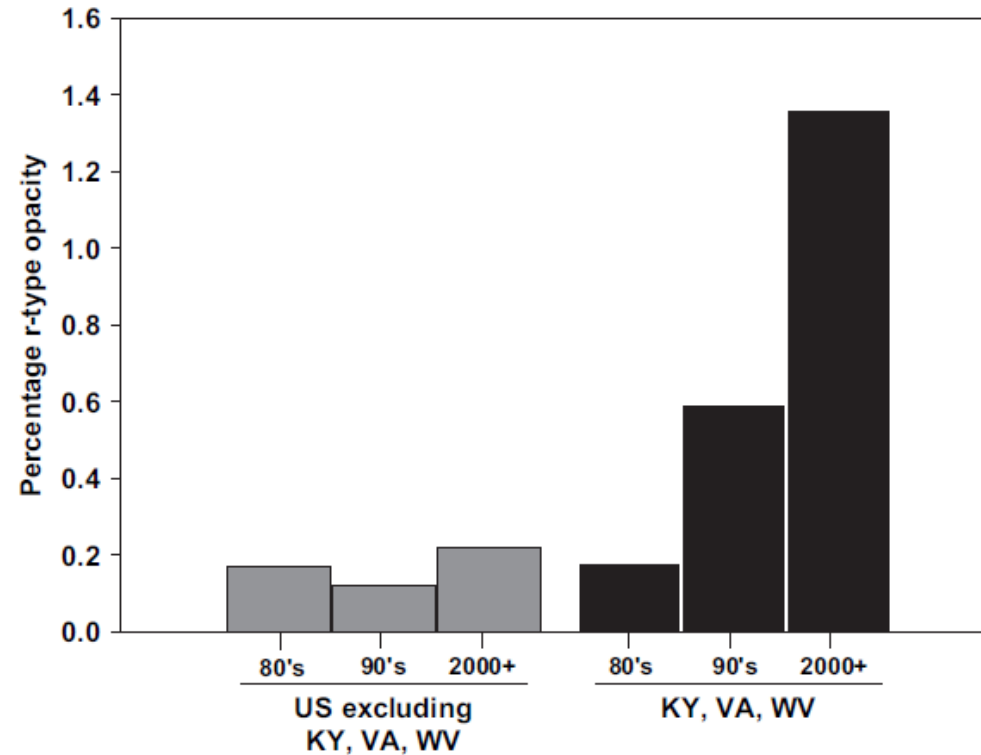


Figure 3 Percentage of r-type opacities by region and decade, 1980–2008.

Is the increasing prevalence and severity of coal workers' pneumoconiosis in the United States due to increasing silica exposure?

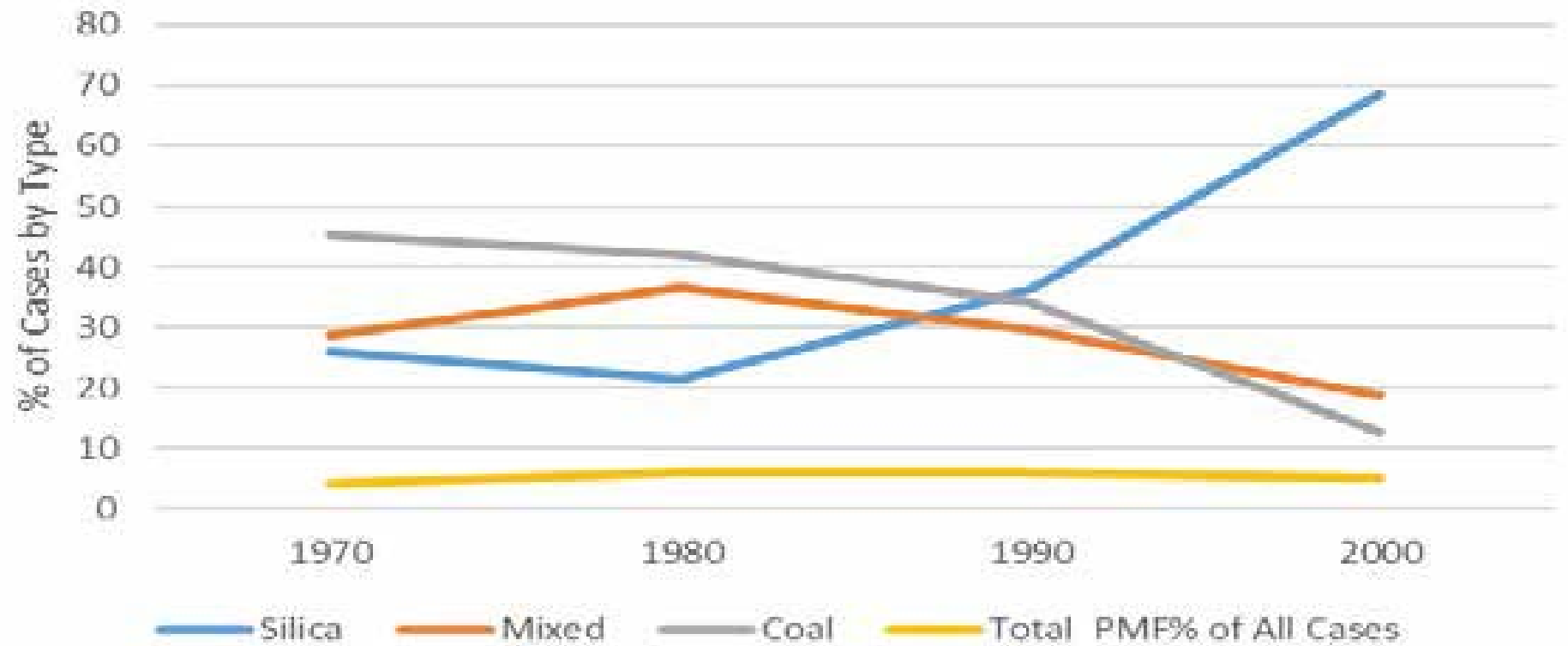
Robert A C Cohen

lung pathology. These authors report increases in the prevalence of r-type opacities, as well as more advanced forms of pneumoconiosis, findings which could be explained by increasing exposure to respirable crystalline silica. The increase in prevalence of r-type opacities was most pronounced in the three states of Kentucky, West Virginia and Virginia, and persisted after adjustment for the overall prevalence of opacities, age of the miner (surrogate for tenure) and the reading patterns of the film readers.

The possible effect of selection/participation bias must be considered. The

dust control activities. The emerging patterns of increasingly prevalent and more severe lung disease among US coal miners call for more effective enforcement of dust standards, and improved controls for both respirable dust and silica.^{13 14}

Proportion of PMF Types by Decade





FEDERAL REGISTER

The Daily Journal of the United States Government



PR Proposed Rule

Respirable Silica (Quartz)

A Proposed Rule by the [Mine Safety and Health Administration](#) on 08/29/2019



New MSHA Silica Rule???

Rediscovery/Resurgence of Black Lung in Australia

- Myth that CWP was eliminated for 30 years
- Reports of many cases that were missed



AUSTRALIA

MAJOR TOURIST DESTINATIONS





Myth that Black Lung Was Eliminated

- 1998 Review of Coal Workers' Health Scheme concluded that pneumoconiosis was not a problem
- Changed surveillance program into fitness for work program
- Anyone could take CXRs and no standards for whom or how the images were classified
- Images sent to the Department of Natural Resources and Mining – but not reviewed
- No central data capture or processing



Myth that Black Lung Was Eliminated

- ▶ First Black Lung Case in Queensland diagnosed May 2015 after 30 years of not one case!
- ▶ 1984 – E.M. Rathus' Investigation into CWP in Queensland (had done prior report in 1970)
 - ▶ 7907 CXRs reviewed
 - ▶ 499 Abnormal findings
 - ▶ 75 Cases documented of CWP
 - ▶ No history of any follow up



Recommendations of Rathus Report 1970

- Noted that medical surveillance was essential to feed back on effectiveness of dust controls
- Recommended collaboration between physicians, industrial hygienists, and mining engineers
- Recommended using UK Standards for dust
- Recommended extension of CMWHS to Silica exposed workers in 1970

REPORT

ON

**THE QUEENSLAND COAL BOARD
COAL MINERS' HEALTH SCHEME**

* * *

**Chest X-Ray and Emphysema Check Survey
of Colliery Employees in Queensland**

by

Dr. E.M. RATHUS,
M.B., Ch.B,
(U.C.T.) F.A.C.O.M.

Dr. E.W. ABRAHAMS,
M.B., B.S. (Melb),
M.D. (Melb), M.R.C.P. (Lond),
F.R.A.C.P., F.R.C.P. (Lond).

Medical Consultants to The Queensland Coal Board

MAY, 1984

**THE QUEENSLAND COAL BOARD
G.P.O. BOX 384
BRISBANE. 4001. Q.**

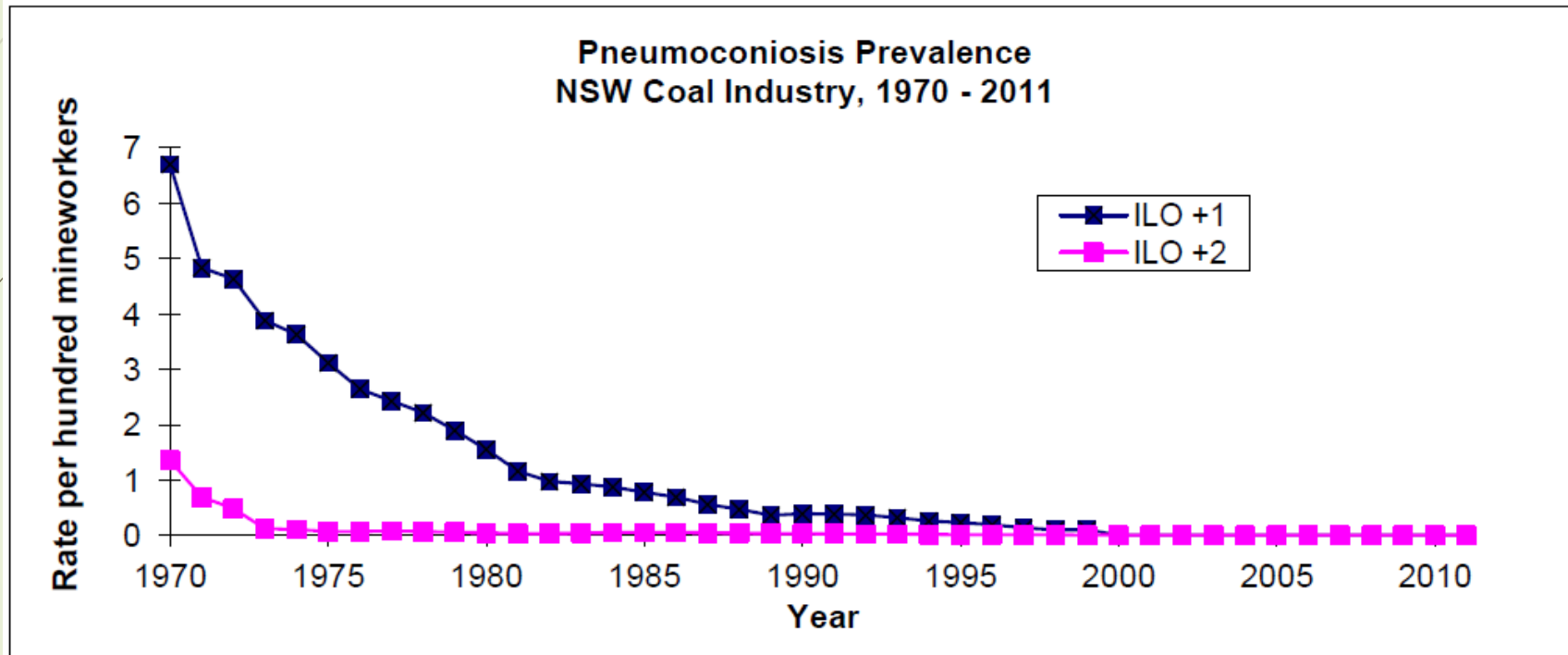




Recommendations of Rathus Report 1984

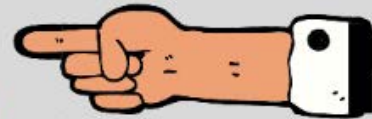
- ▶ Recommended CXR every 5 years for early detection (i.e. secondary prevention)
- ▶ Annual CXR for miners with positive findings
- ▶ Require CXR on retirement to notify miner and for public health analysis.
- ▶ Establish medical service to carry CMWHS to coordinate exams and evaluate data
 - ▶ Follow up on retired miners by CXR on routine basis
 - ▶ Centralized data collection
 - ▶ Initiate research into health problems of coal miners
- ▶ Recommended extension of CMWHS to Silica exposed workers in 1970

Cases of CWP in Australia Reported by Coal Services, Inc.



The ILO classification of x-rays is a method of grading based on x-ray appearance and may be, in practical terms, interpreted as the following:
ILO+1 = people with diagnostic features of dust exposure but no clinical symptoms
ILO +2 = People with more severe dust exposure than above and likely to have symptoms

Dust Management System Failures But wait....



**Naked
Disinformation**

*But the Emperor has no clothes!!!
There is black lung in Australia!!*



Images Brought to US for Review

- ▶ UMWA Convention with fraternal unions – CFMEU Australia
- ▶ Several miners had been diagnosed with other diseases than black lung – i.e. Sarcoidosis
- ▶ Reviewed images which were consistent with CWP
- ▶ Review of chest imaging of random sample of 300 miners found 18 new cases

Black lung inquiry finds 'catastrophic failure' in public administration in Queensland

By Leonie Mellor, Rachel Riga and staff

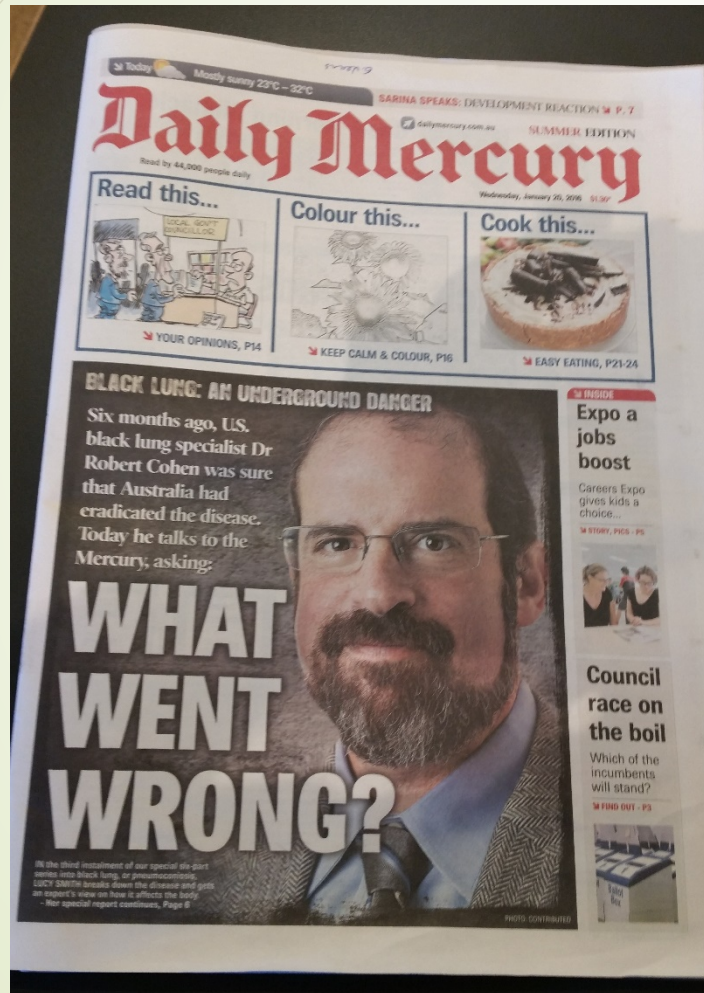
Updated Mon 29 May 2017, 12:59am



PHOTO: Since its re-emergence in 2015, 21 miners have been confirmed to have black lung disease. (Supplied)



Discovery of Cases Lead to Parliamentary Investigation



- Miners with Black Lung
- Union
- Industry
- Government Regulators
- Thoracic Society
- Radiology Society
- College of Occupational Medicine

Australian Federal Government



COMMONWEALTH OF AUSTRALIA

Proof Committee Hansard

SENATE

SENATE SELECT COMMITTEE ON HEALTH

Health policy, administration and expenditure



Queensland Parliament Investigation Report Issued May 2017



Parliamentary
Committees 

Black lung

white lies

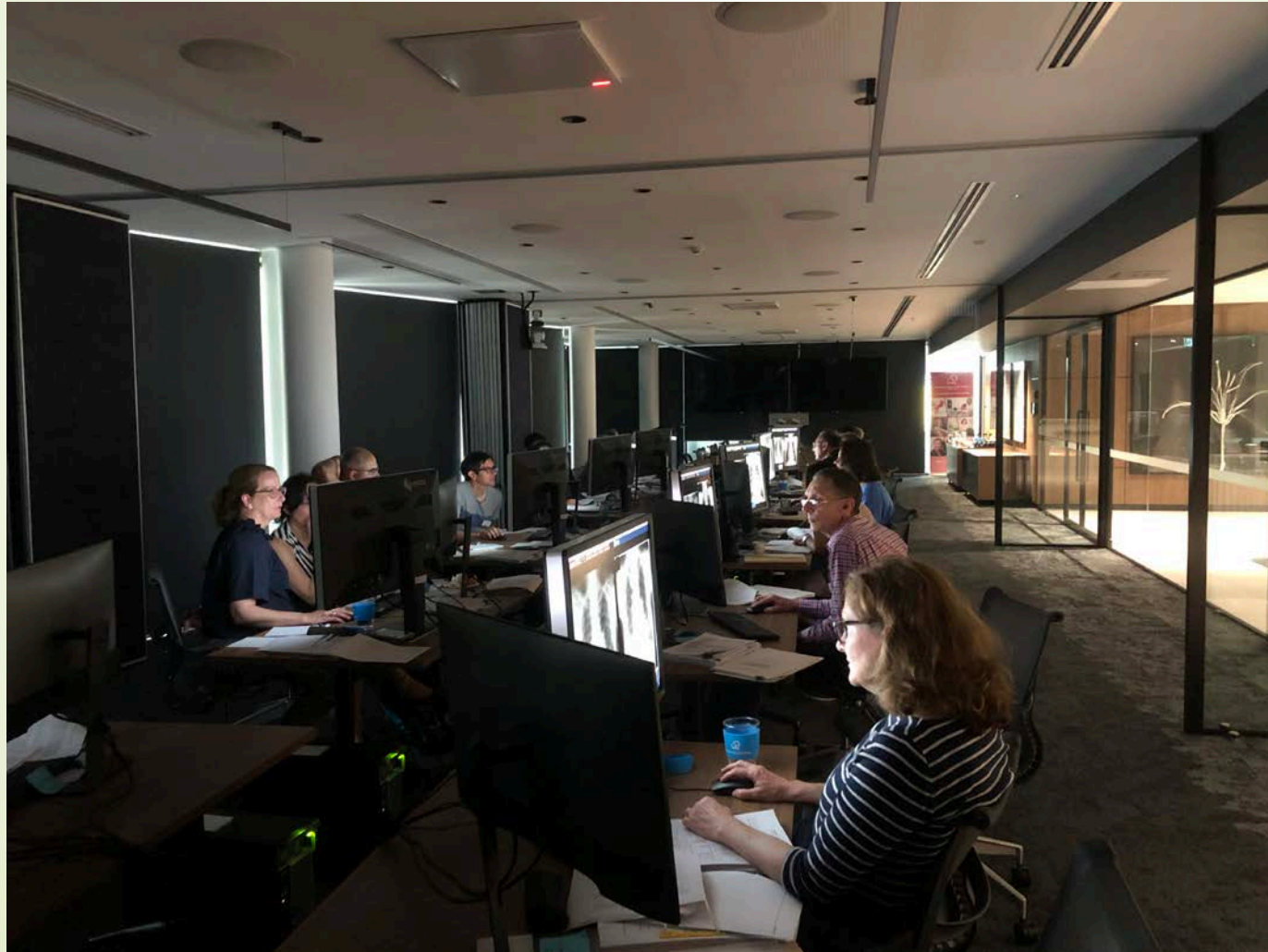
**Inquiry into the re-identification of Coal
Workers' Pneumoconiosis in Queensland**

MINERS' HEALTH MATTERS



Play video

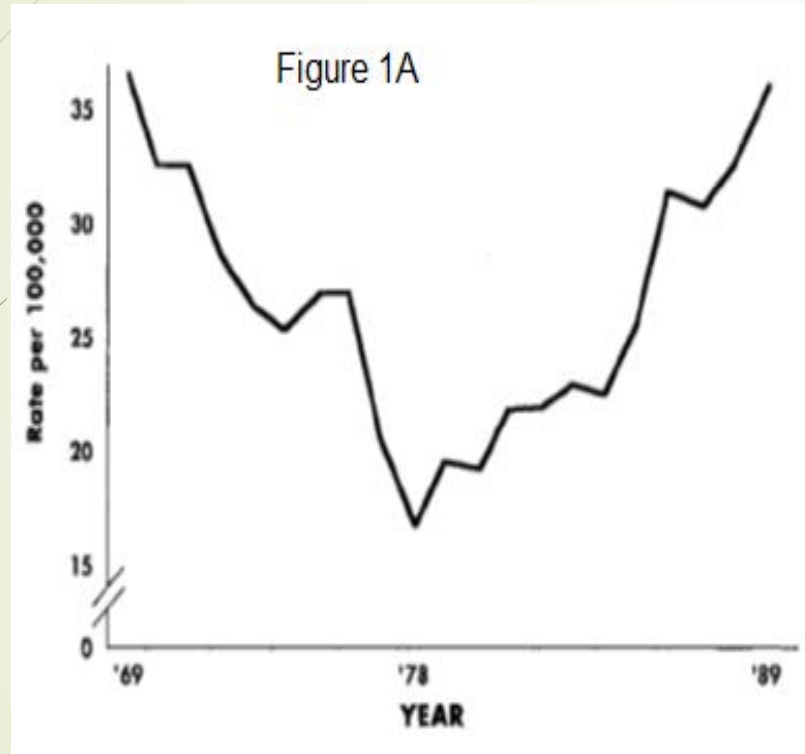
B-Reading Courses – Brisbane – Now 31 B-readers in NSW, QLD, WA, Vic



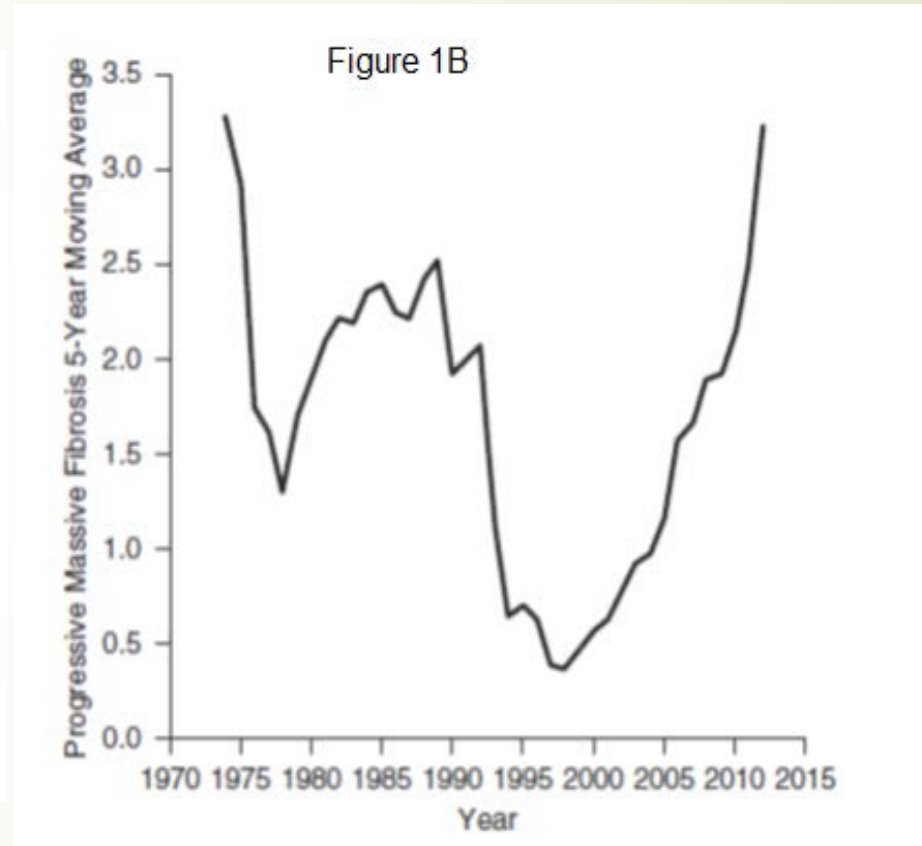
DNRME HSU Goes from 6 to 23 Workers



U Shaped Curve of Concern in Public Health



New York City TB Rate/100,000 Pop
1969-1989



Prevalence (%) of PMF among
Appalachian Working Miners >25
years tenure. 1974-2012



IN MEMORY OF
THE MEN, WOMEN AND CHILDREN
WHO LOST THEIR LIVES
IN FREEDOM'S CAUSE
AT LUDLOW, COLORADO
APRIL 20, 1914.
ERECTED BY THE
UNITED MINE WORKERS OF AMERICA

Letcher County Coal Miners' Memorial

Jackhorn, Kentucky



**IN MEMORY OF THOSE WHO GAVE
THEIR LIVES FOR BLACK GOLD**











Acknowledgements - Collaborators

MinER Center at UIC

Kirsten Almberg, PhD

Leonard Go, MD

Kathleen Kennedy, PhD

Lee Friedman, PhD

National Jewish Health

Cecile Rose, MD, MPH

University of New South Wales

Deborah Yates, MD

Guy Marks, MD

Trevor Waite, PhD

University of Queensland

David Cliff