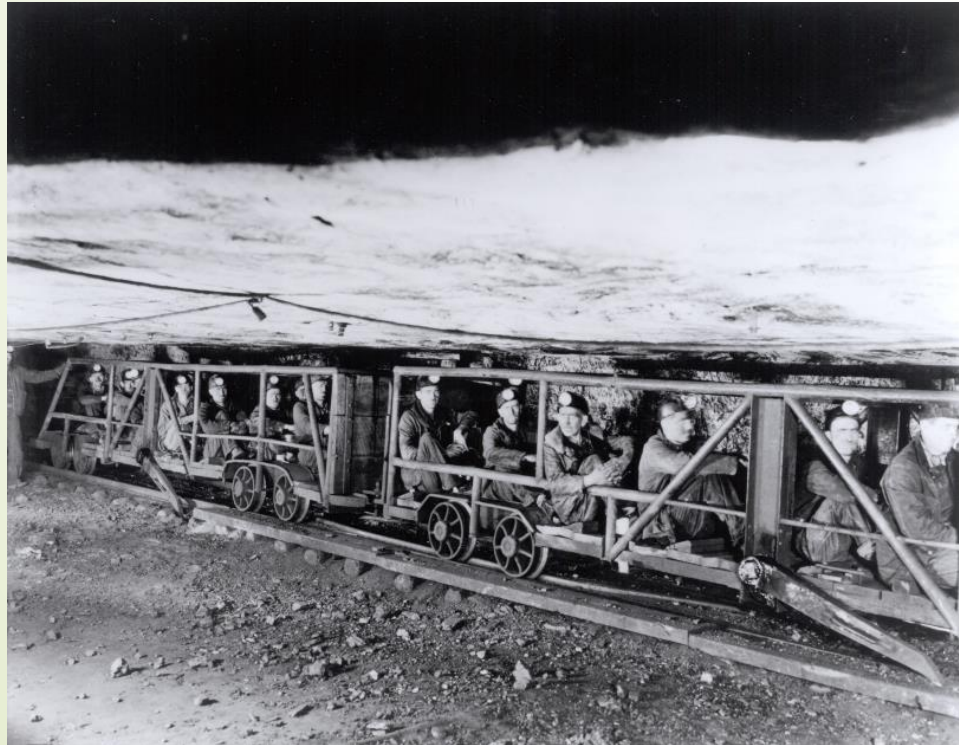


Low Dust Levels from Mine sampling does not replace the need for Medical Surveillance:

The role of Health Screening and Secondary Prevention

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



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National Institute for
Occupational Safety and Health
NIOSH



Objectives

- Describe the role of preventive measures in public health for Black Lung
- Importance of Secondary Prevention
- Inter-relation between primary and secondary prevention
- Need for medical screening/surveillance even after exposure ceases – former miners



Primary Prevention

- ▶ Regulations and Standards for Exposure
 - ▶ US PEL - 2014-present 1.5 mg/m³ - Quartz 0.075/m³
 - ▶ Queensland PEL – 2.5 mg/m³ – Silica 0.1 mg/m³
 - ▶ Recommended exposure limit – 1 mg/m³ 1995 - NIOSH
- ▶ Monitoring and Enforcement
 - ▶ US - MSHA Inspectors, Operator Samples
 - ▶ DNRME inspectors, Private IH Companies, SIMTARS

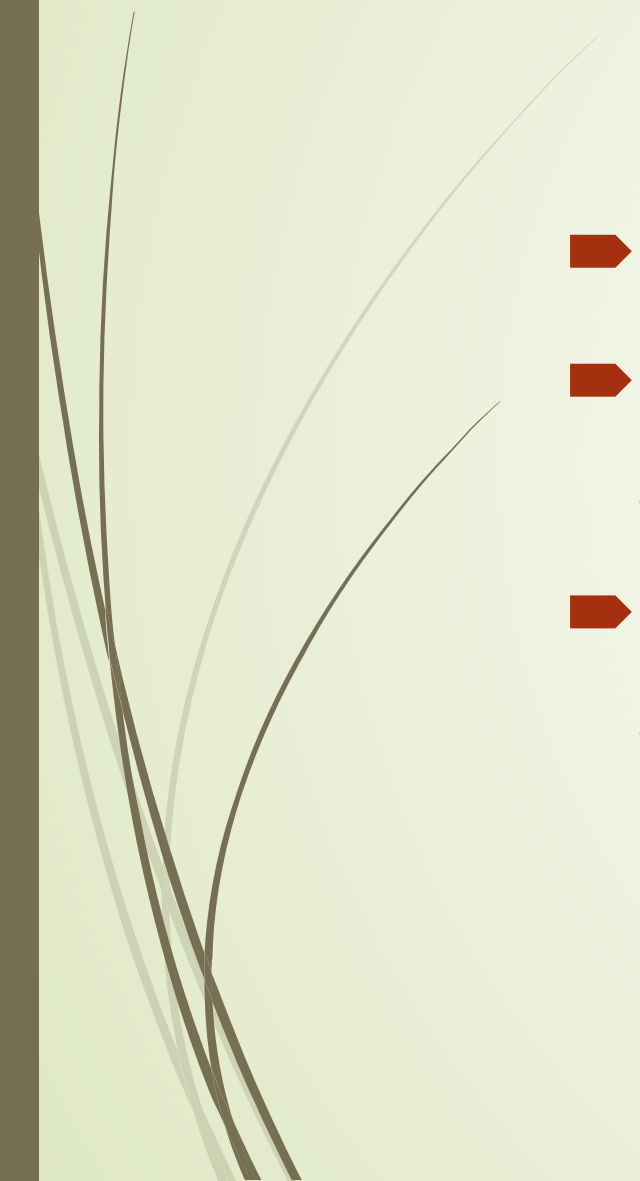


Secondary Prevention – Medical Screening/Surveillance

- Detect early disease
 - Remove from exposure – worker enters compensation system
 - Mitigate Exposure – return to work
- Identify failure of primary prevention
- Understand the natural history of disease
- Inform regulatory agencies



How Does Disease Go Undetected?

- Often no initial symptoms
 - Loss of significant lung function before affecting activity
 - Attribute symptoms to other causes, i.e. aging
- 



Secondary Prevention

Coal Worker's Health Surveillance Program – MSHA/NIOSH
Coal Mine Workers Health Scheme - DNRME

USA

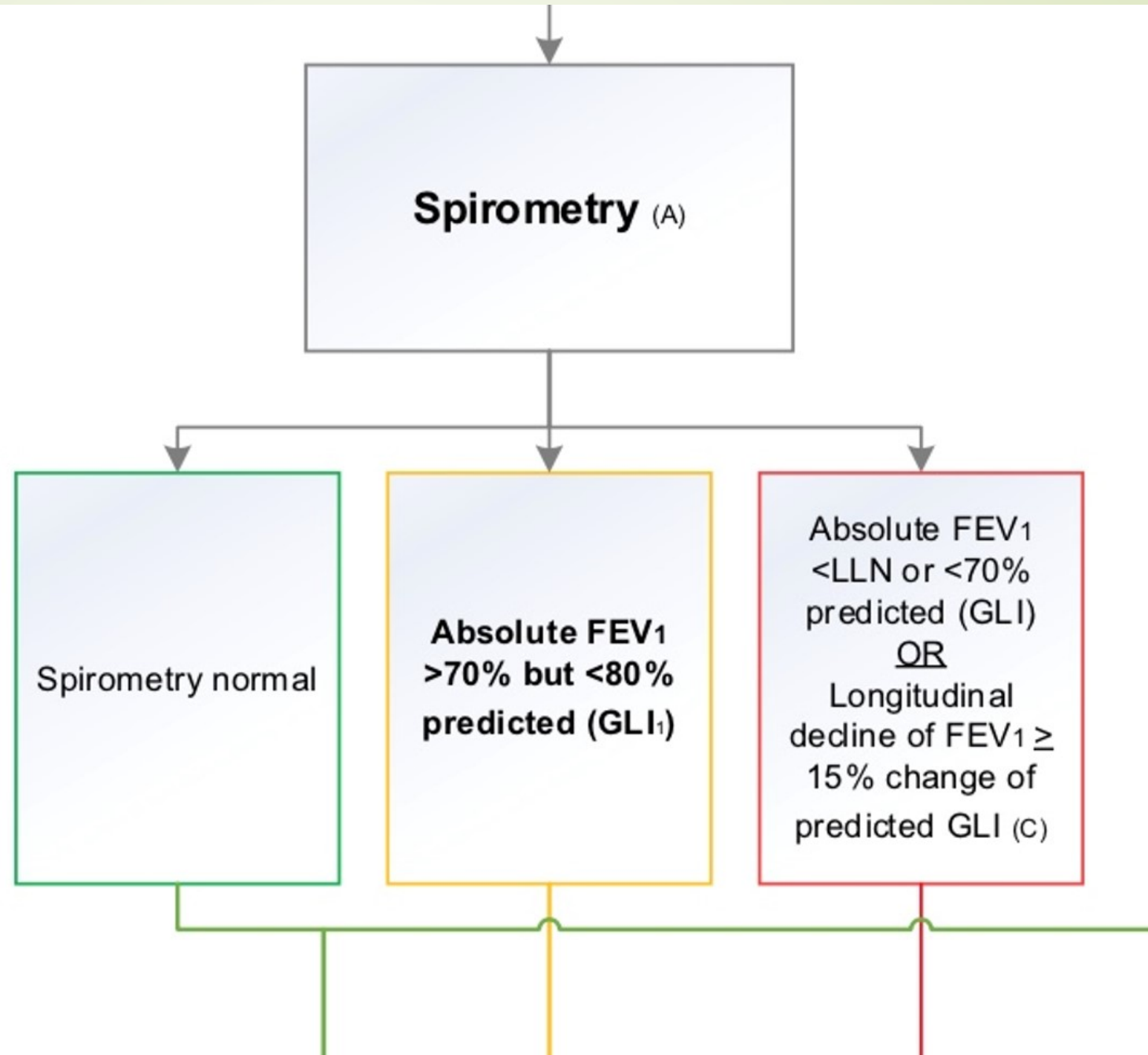
- ▶ Mandated by MSHA
- ▶ Voluntary Program
- ▶ First exam on hire, then followed every 5 years
- ▶ Operator Organized Surveillance
 - ▶ Only 1/3 of miners participate
 - ▶ Chest Radiography
 - ▶ Read centrally by dual b-readers
 - ▶ Lung Function Testing
- ▶ NIOSH Mobile Van

Australia

- ▶ Mandated by DNRME
- ▶ Mandatory Program
- ▶ First exam on hire, then followed every 5 years
- ▶ Operator Organized Surveillance
 - ▶ AMAs and EMOs
 - ▶ Chest Radiography – read centrally by dual B-readers
 - ▶ Lung Function Testing
- ▶ Full Medical Exam
- ▶ Queensland Mobile Van



Lung function



Chest X-Ray (CXR)

All CXRs (PA) to be classified
by two B readers (B)

CXR 0/-, 0/0 or 0/1
(D)

CXR $\geq 1/0$ (after
dual read) (E)

**CXR shows
abnormal finding
unrelated to dust
exposure**





Dust monitoring in the US

- ▶ Two primary metrics are measured in US
 - ▶ Total mass concentration of respirable dust (mg/m³)
 - ▶ Mass fraction of quartz (%) - commonly referred to as “silica”
- ▶ “New dust rule” (2014) did not change metrics, rather it
 - ▶ Reduced the PEL for most miners from 2.0 to 1.5 mg/m³
 - ▶ Mandated use of the CPDM for operator samples
 - ▶ Maintained a 5% mass limit for silica
 - ▶ Changed sampling rules

Sampling equipment in US mines

Air pump + cyclone for traditional gravimetric samples Continuous Personal Dust Monitor (CPDM)



zefon.com



CDC/NIOSH

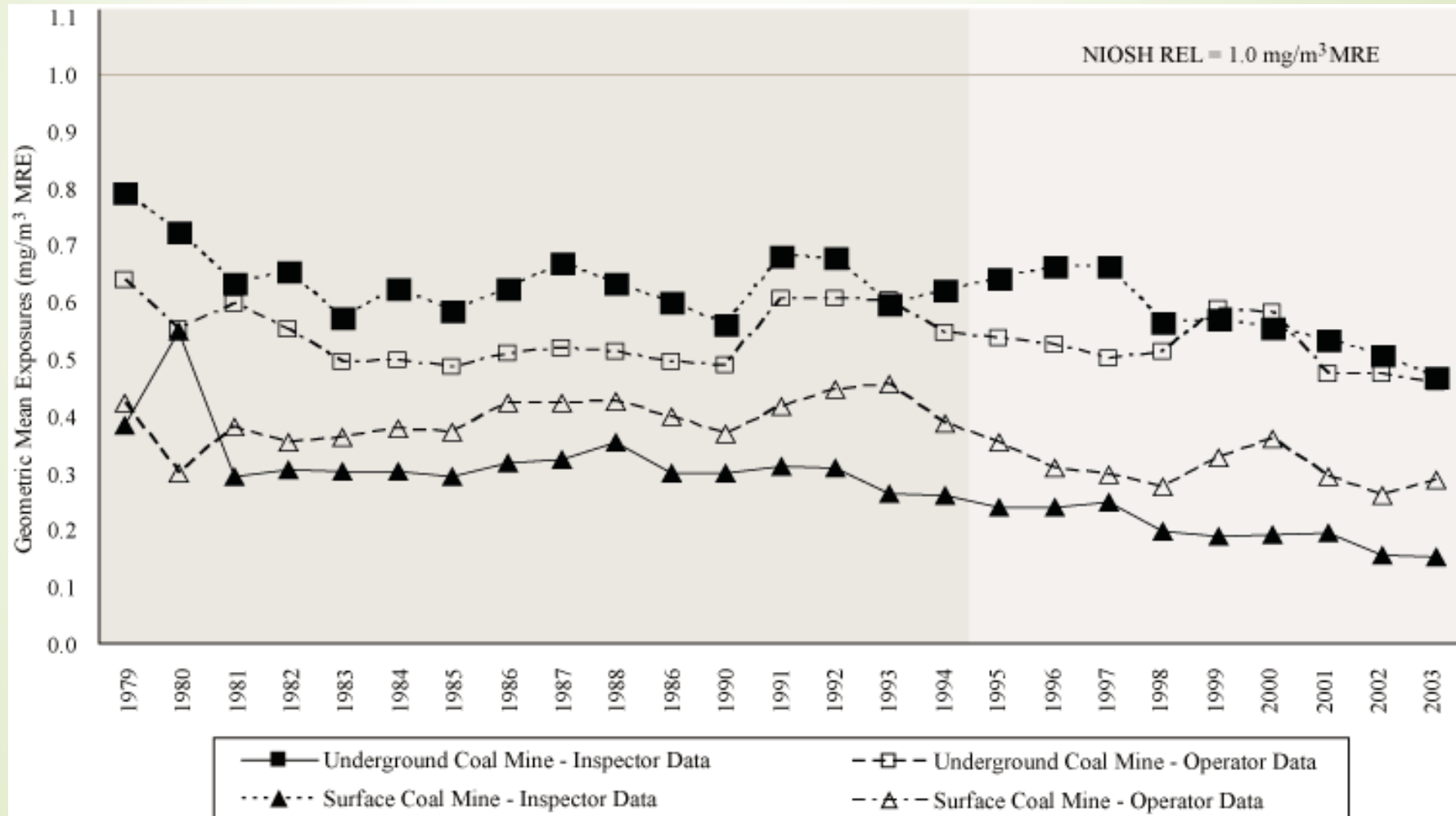


Monitoring in US mines

- ▶ We rely primarily on personal dust samples, using a system designed to monitor the individuals expected to have maximum exposures
- ▶ Monitored individuals are those working in the “designated occupation” or “DO” – most often these are CM or LW operators, or roof bolters
- ▶ We focus monitoring efforts during typical production, and thus not during other development work
- ▶ Samples are collected both by the mine operator and by MSHA

Respirable dust in coal mining: 1982–2003

Geometric mean exposures – MSHA inspector and mine operator samples NIOSH WoRLD Report 2007, Figure 2-6.



Respirable silica in coal mining: 1982–2003 Geometric mean exposures MSHA inspector and mine operator samples NIOSH WoRLD Report 2007, Figure 3-5a.

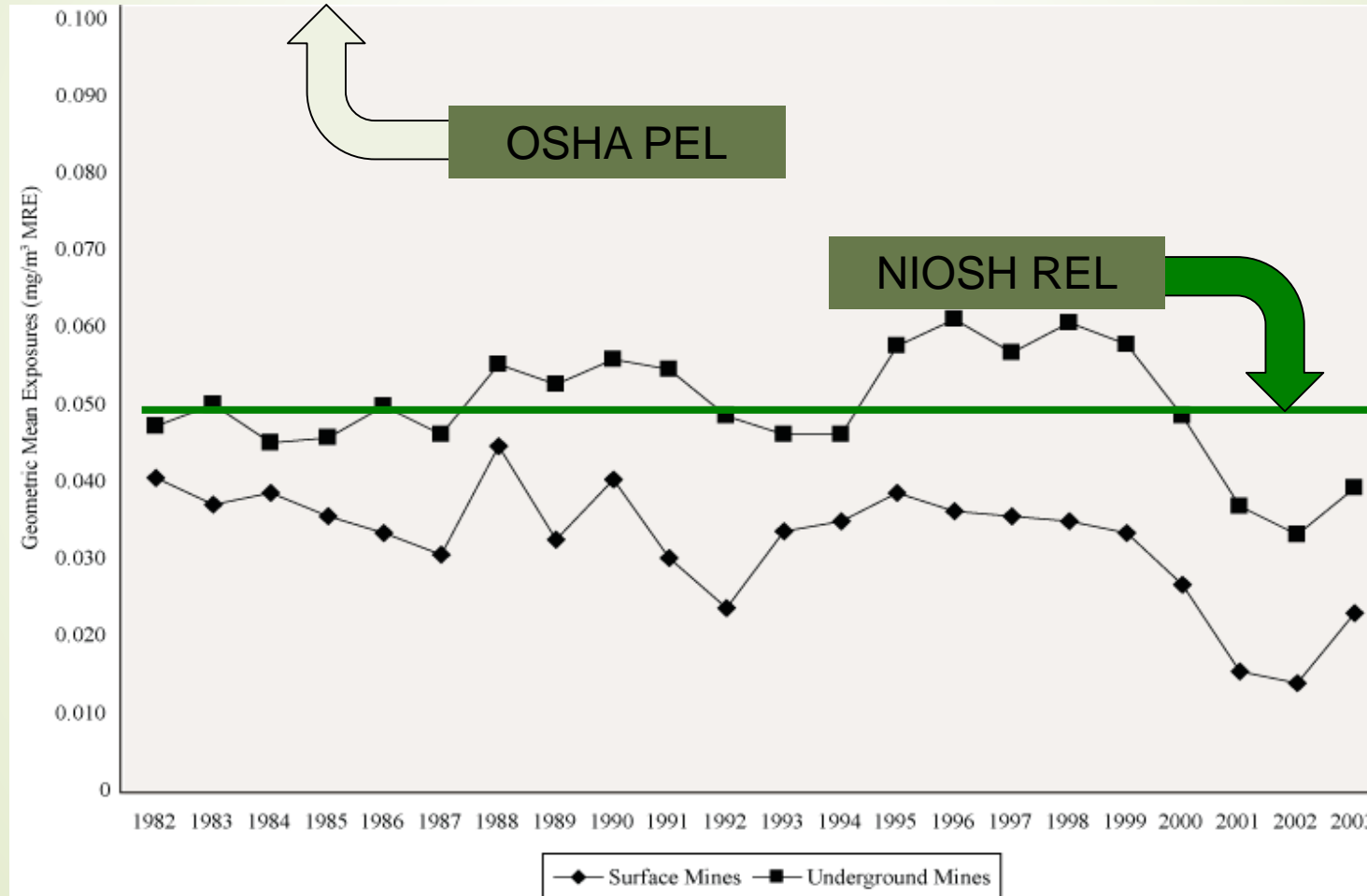
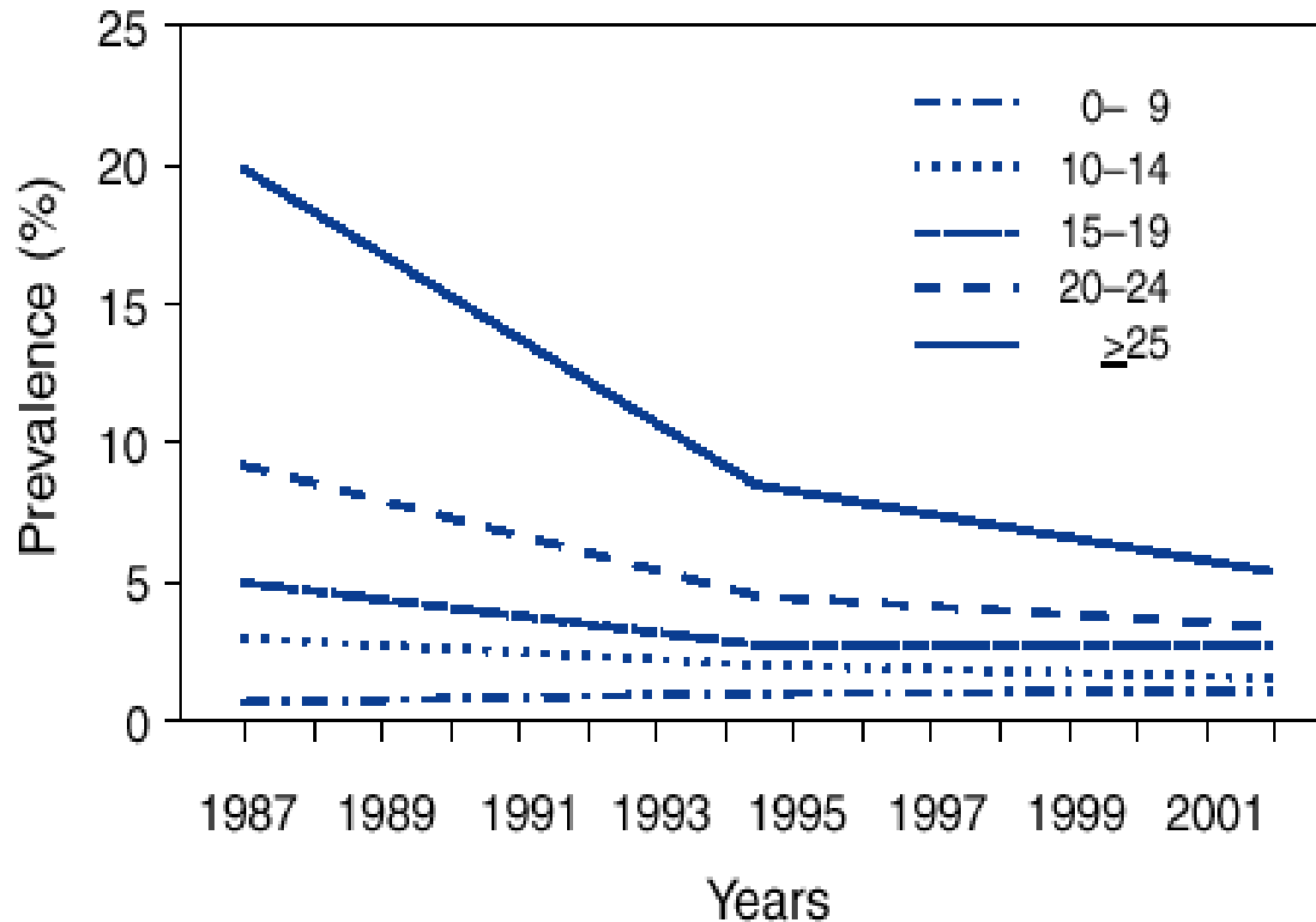
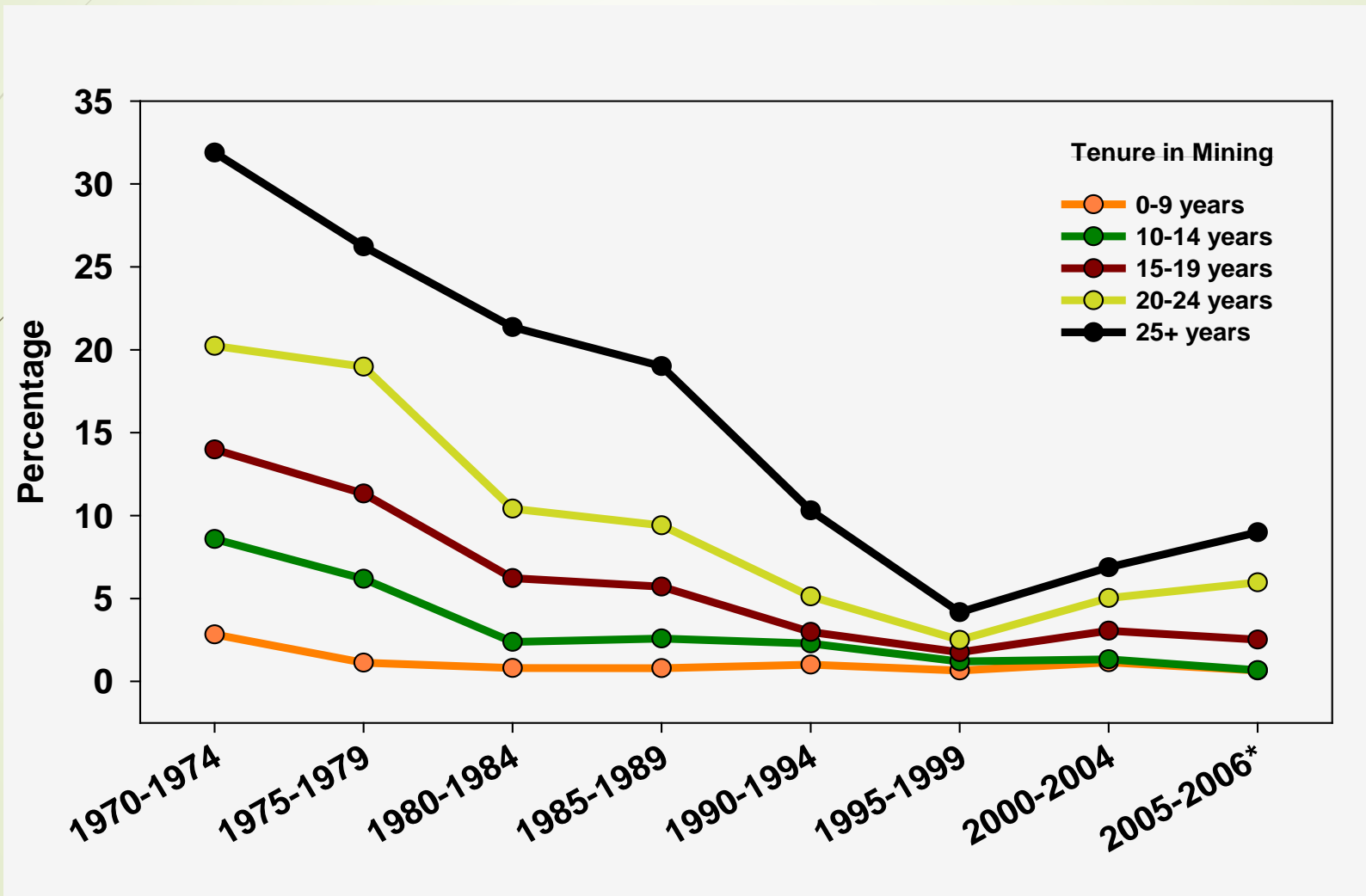


FIGURE 2. Trends in coal workers' pneumoconiosis prevalence by tenure among examinees employed at underground coal mines — U.S. National Coal Workers' X-Ray Surveillance Program, 1987–2002

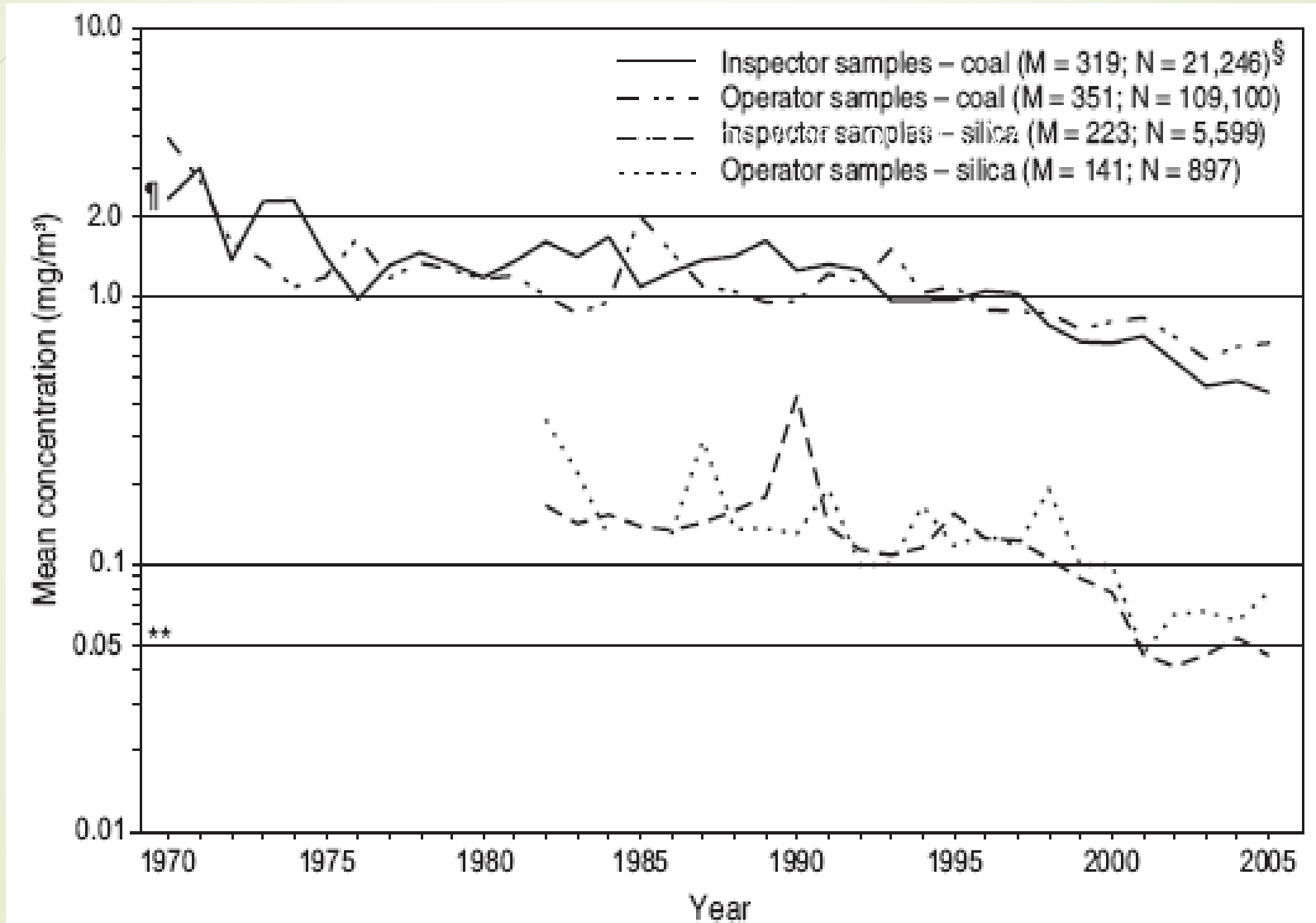


Percent of miners with Coal Workers' Pneumoconiosis (CWP) by tenure in mining, 1970-2006



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

Dust sampling central Appalachia



The logo for the Centers for Disease Control and Prevention (CDC), featuring the letters "CDC" in a bold, sans-serif font above a stylized graphic of radiating lines.The logo for the Morbidity and Mortality Weekly Report (MMWR), consisting of the letters "MMWR" in a large, bold, white sans-serif font set against a blue rectangular background.

Morbidity and Mortality Weekly Report

Weekly

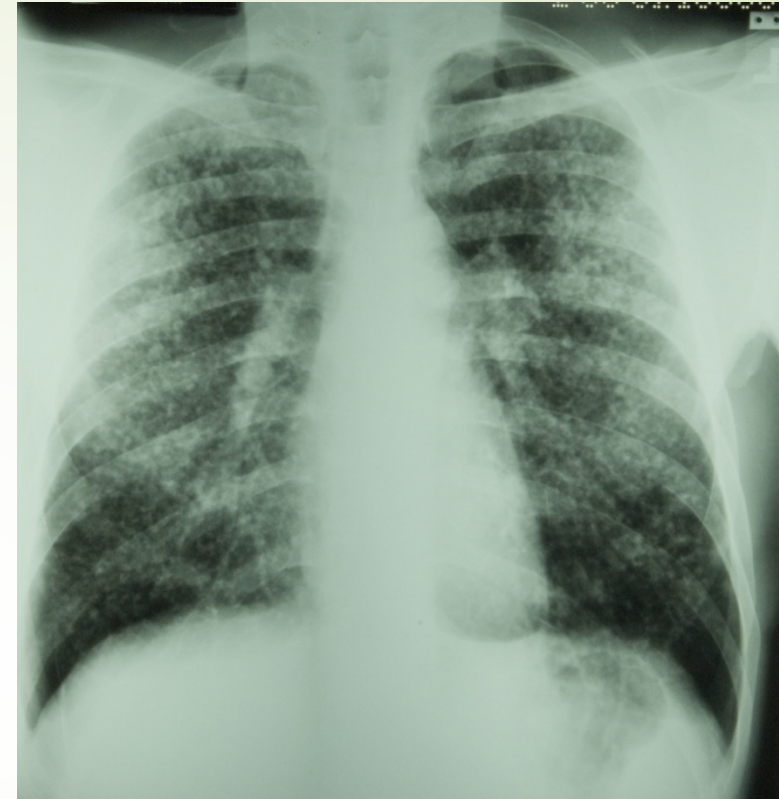
July 6, 2007 / Vol. 56 / No. 26

Advanced Pneumoconiosis Among Working Underground Coal Miners — Eastern Kentucky and Southwestern Virginia, 2006

Current regulations for U.S. underground coal mines, mandated by federal legislation in 1969 and amended in 1977, include provisions to prevent the occurrence of pneumoconiosis* (1). However, in 2005 and 2006, clusters of rapidly progressing and potentially disabling pneumoconiosis were reported in certain geographic areas (2,3). In response to these reports, CDC's National Institute for Occupational Safety and Health (NIOSH) instituted field surveys conducted under the Enhanced Coal Workers' Health Surveillance Program (ECWHSP).[†] This report describes the results of those sur-

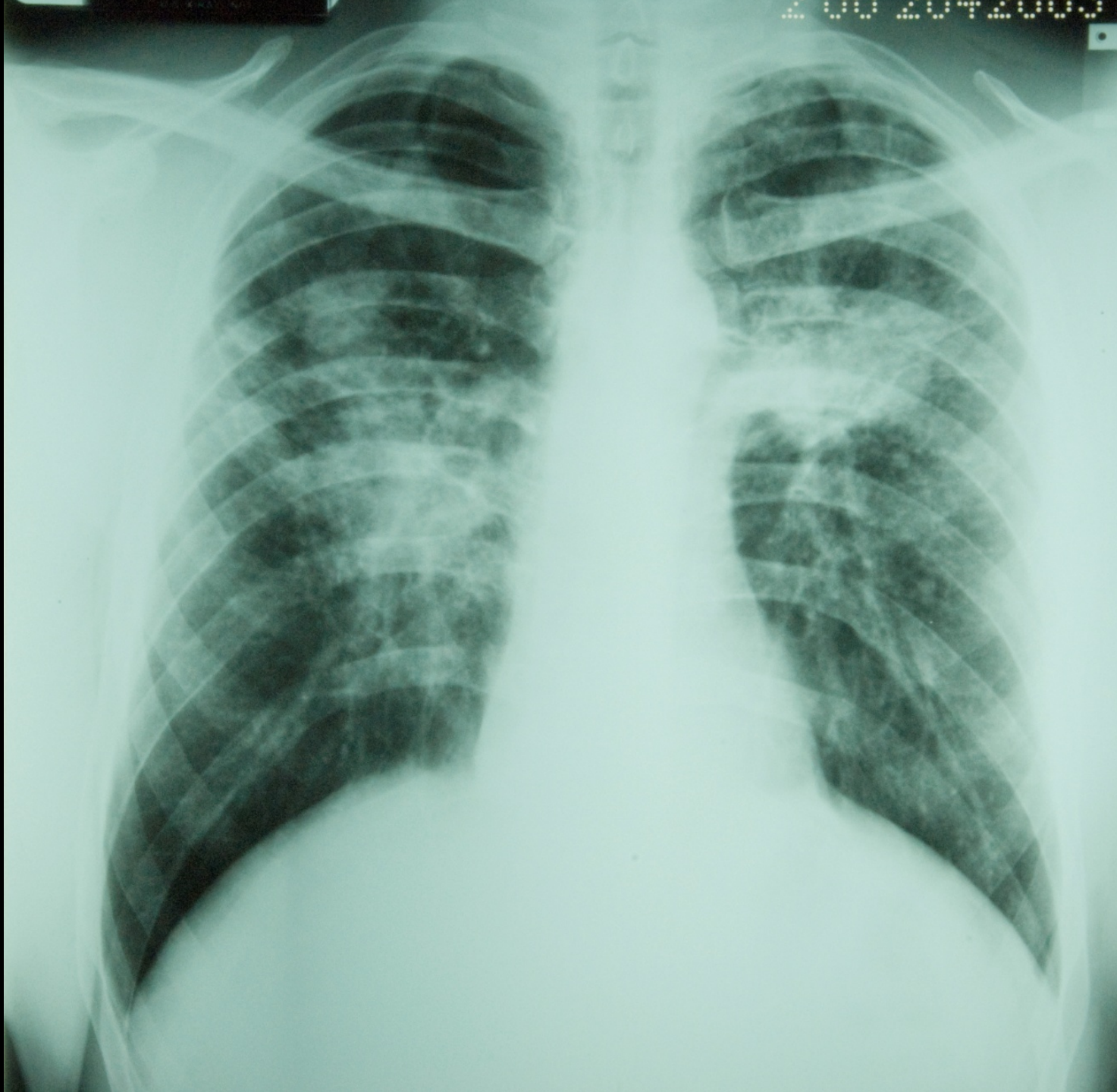


1997 – Category 3/3 – Stage O
37 years old – 16 years underground



2000 – Category 3/3 – Stage B
40 years old – 19 years underground

Upshur County, West Virginia
Started mining in 1981 at 21 years of age
Roof bolter



Tazewell County, VA

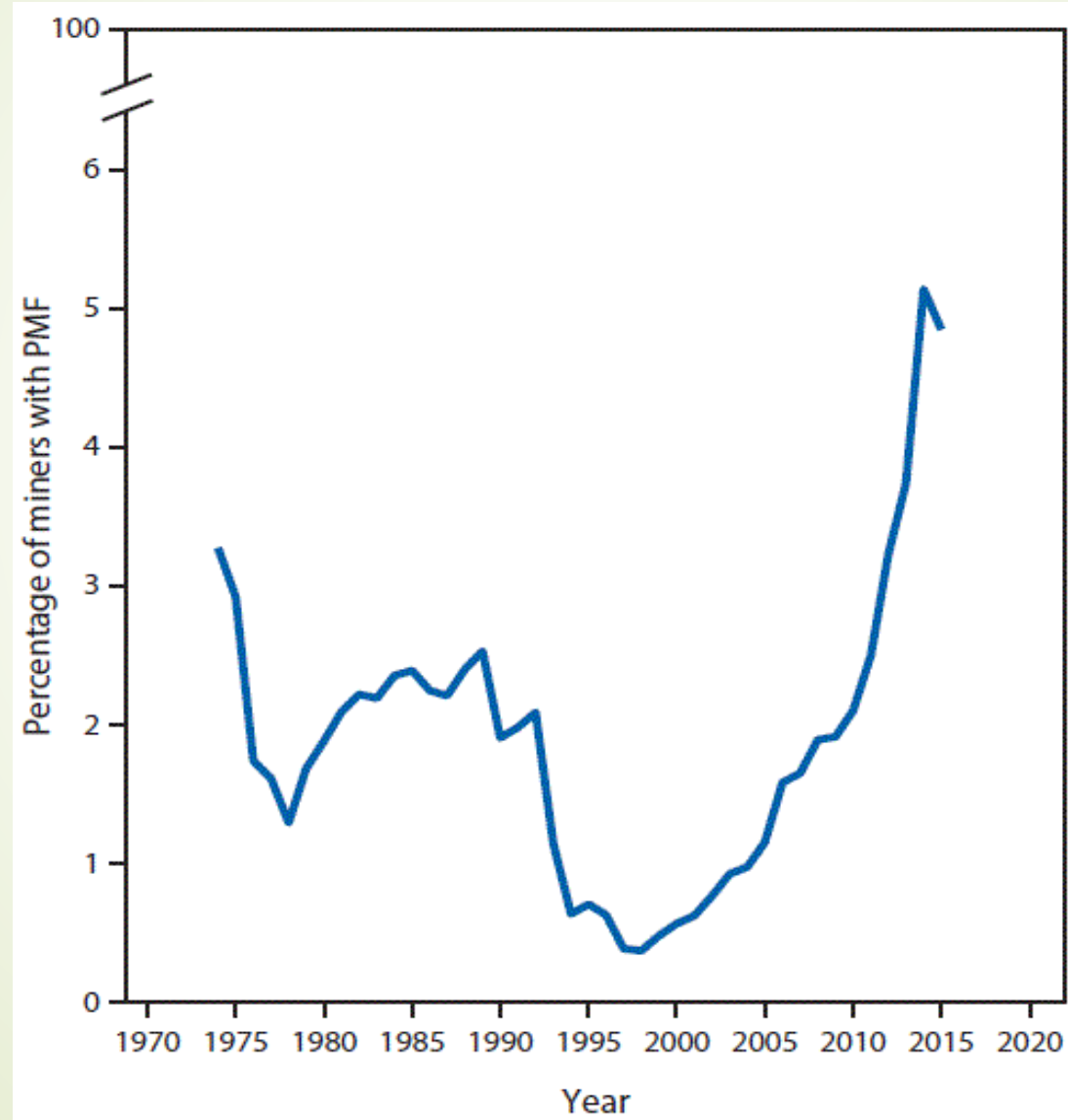
**Started mining in
1980 at 20 years old**

2002 – Category 3/3
Stage C

42 years old with
22 years underground

Roof Bolter/
Shuttle Car Operator/
Scoop Operator

Cases of PMF in the Ky, Va, WVA



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

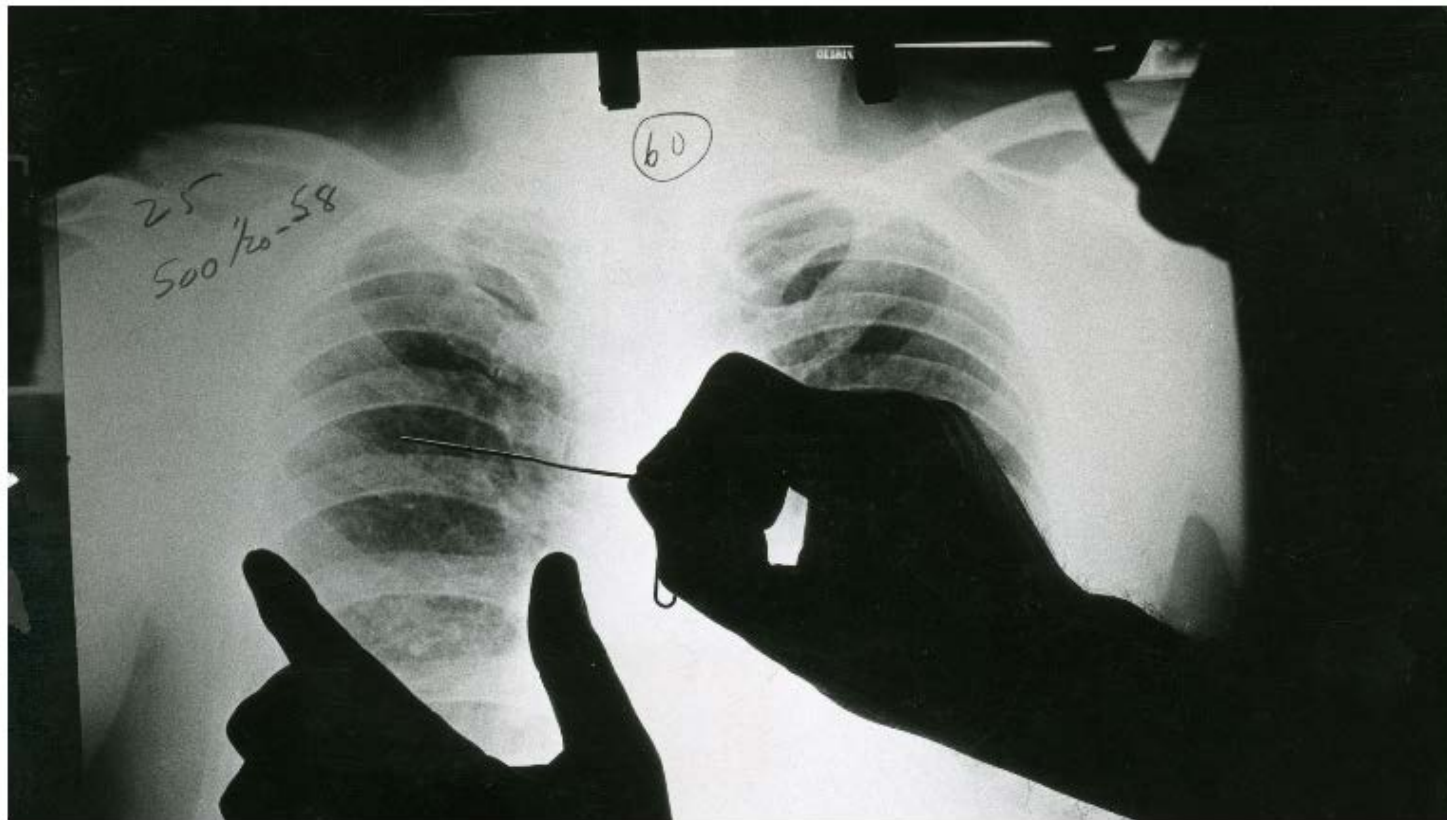
February 6, 2018 · 11:01 AM ET
Heard on All Things Considered



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

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

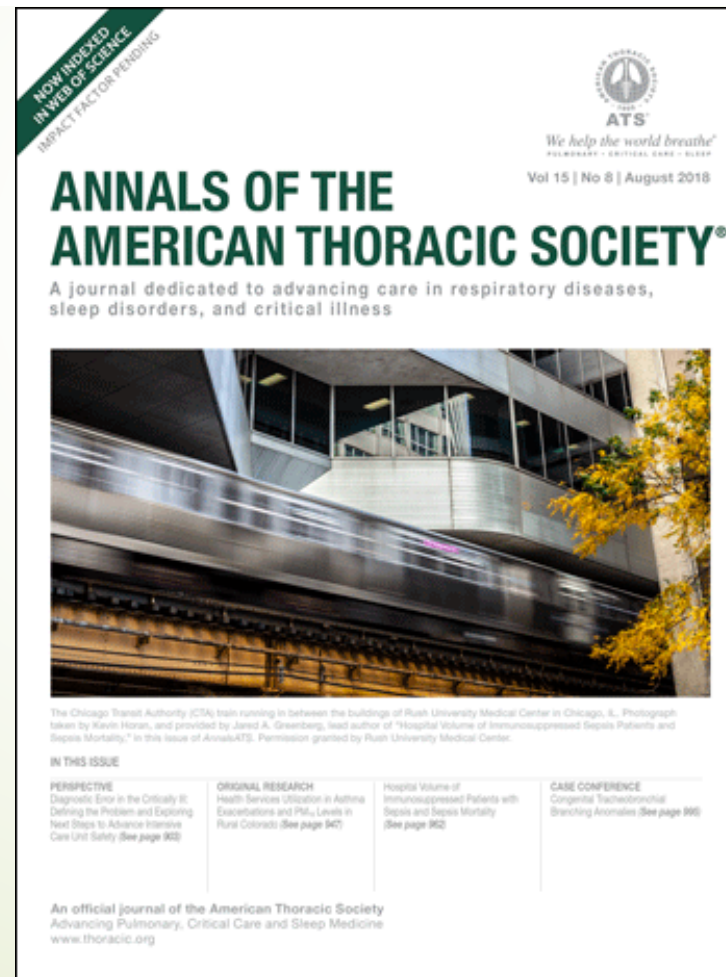
<https://doi.org/10.1513/AnnalsATS.201804-261OC>

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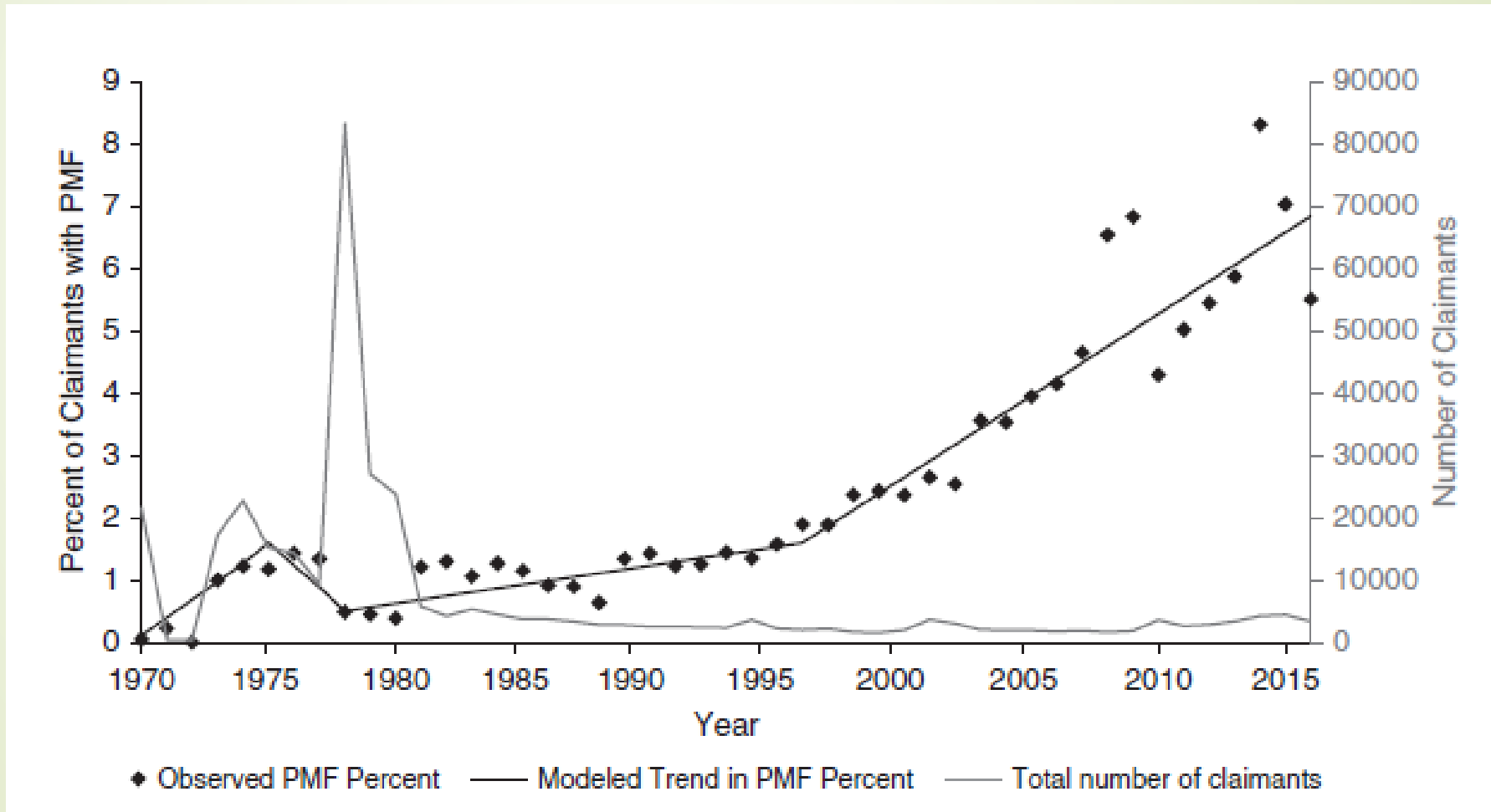
The Chicago Transit Authority (CTA) train running between the buildings of Rush University Medical Center in Chicago, IL. Photograph taken by Kevin Horan, and provided by Jared A. Greenberg, lead author of "Hospital Volume of Immunosuppressed Septic Patients and Septic Mortality," in this issue of AnnalsATS. Permission granted by Rush University Medical Center.

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 847)	Hospital Volume of Immunosuppressed Patients with Septic and Septic Mortality (See page 852)	CASE CONFERENCE Congenital Tracheobronchial Branching Anomalies (See page 890)
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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





CMDLD Progression

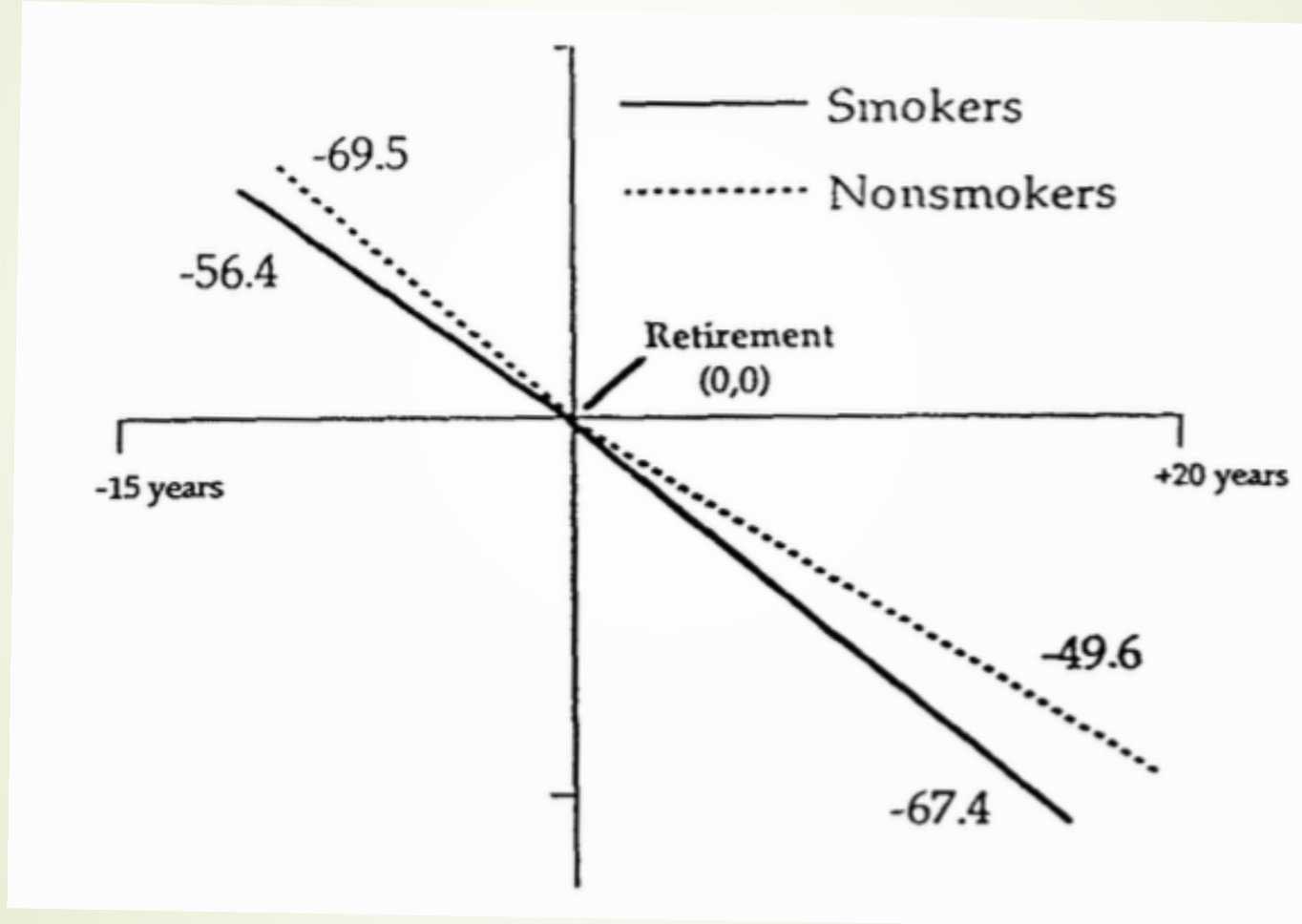
- Radiographic CMDLD
 - Nodular CWP
 - Dust-related diffuse fibrosis
- Lung function decline
 - COPD

Results: First and Final CXRs

Table 1. Comparison of International Labour Office (ILO) interpretations of large opacities from CXRs of former U.S. coal miners applying for benefits from the Department of Labor Black Lung Benefits Program, 2000 – 2013.¹

Large Opacity Score at First CXR	Large Opacity Score at Final CXR	Miners (n)
O	O	1,825
A	A	1
O	A	48
O	B	17
O	C	6

FEV1 Decline, Pre- and Post-Retirement





Medical surveillance: Lessons learned

- ▶ Surveillance is essential to monitor disease trends – especially with changes in production and industrial processes.
- ▶ Medical surveillance is important to assess efficacy of primary preventive strategies.
- ▶ Voluntary programs such as those in the US likely underestimate the problem.
- ▶ Retired/former workers and subcontractor miners should be included in surveillance of diseases with latency.
- ▶ Programs should be staffed by trained experts (i.e, ILO B readers, certified spirometry technicians).
- ▶ Programs must stay true to mission/purpose: targeted to detect and prevent occupational dust diseases, not fitness for duty exams.



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