

OMSHR

Office of Mine Safety and Health Research



Health Consequences of Overexposure to Respirable Coal and Silica Dust

Jay Colinet

Senior Scientist

Dust, Ventilation and Toxic Substances Branch

Beckley, WV
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Presentation outline

- Lung diseases in coal mining
- Magnitude of impact on coal mining industry
- Regional “hotspot” findings
- Black lung video

Respirable dust in coal mining

- Dust less than 10 microns in size (cannot be seen with the eye)
- Overexposure can cause lung disease
- 1969 Federal Coal Mine Health and Safety Act first regulated miners' exposures
 - established 2.0 mg/m³ respirable coal mine dust limit
 - required occupational dust sampling by MSHA and mine operators
 - established an X-ray surveillance program for underground coal miners
 - established a federal black lung benefits program
- Control technologies are implemented to reduce worker exposures

Diseases caused by inhalation of coal mine dust

- Fibrotic diseases – damage/destroy lung tissue
 - coal workers' pneumoconiosis "CWP"
 - silicosis
- Airflow diseases "COPD" – block movement of air in and out of lungs
 - bronchitis
 - emphysema
 - mineral dust airway disease

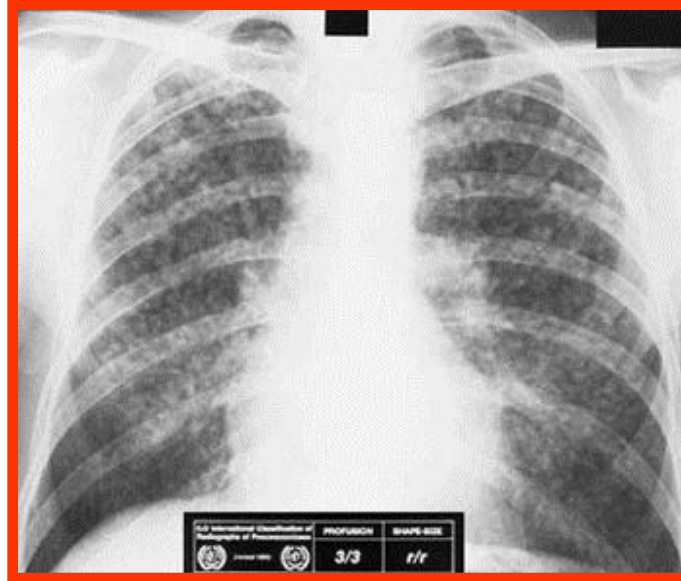
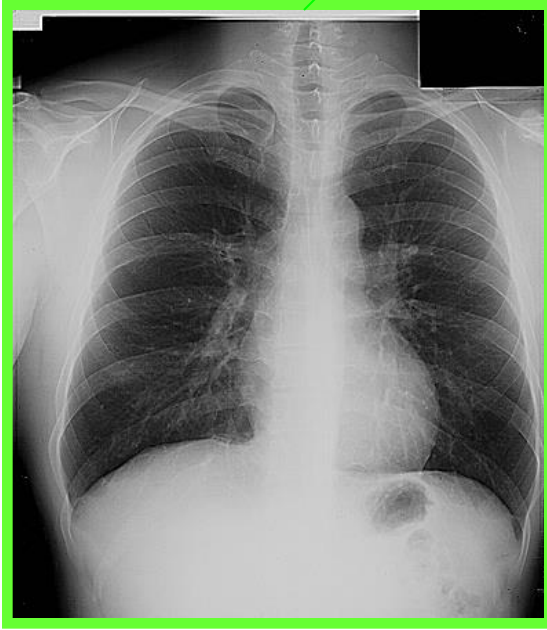
Fibrotic lung diseases in miners

CWP and silicosis

- Similar patterns on chest x-ray
- Simple and Complicated forms of disease
- Complicated form known as Progressive Massive Fibrosis (PMF)
- International Labour Office (ILO) standards are used to determine severity of disease
- **Cannot be cured, so prevention is the key**

ILO classification of radiographs

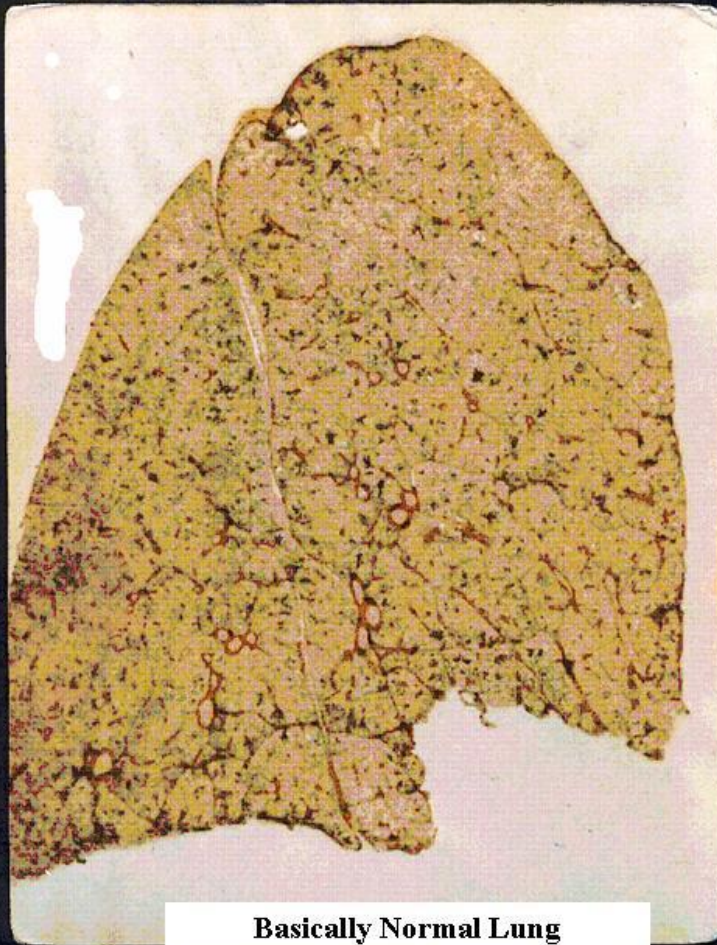
ILO	----- simple CWP -----											--- PMF ---			
classification	0/-	0/0	0/1	1/0	1/1	1/2	2/1	2/2	2/3	3/2	3/3	3/+	A	B	C



Simple CWP or black lung

- Disease development typically takes over 10 years of dust exposure
- Worker may not initially have physical symptoms
- As disease progresses, symptoms do appear
 - coughing
 - wheezing
 - shortness of breath (especially during exercise)
- Greater chance to develop PMF

Coal Workers' Pneumoconiosis



Basically Normal Lung

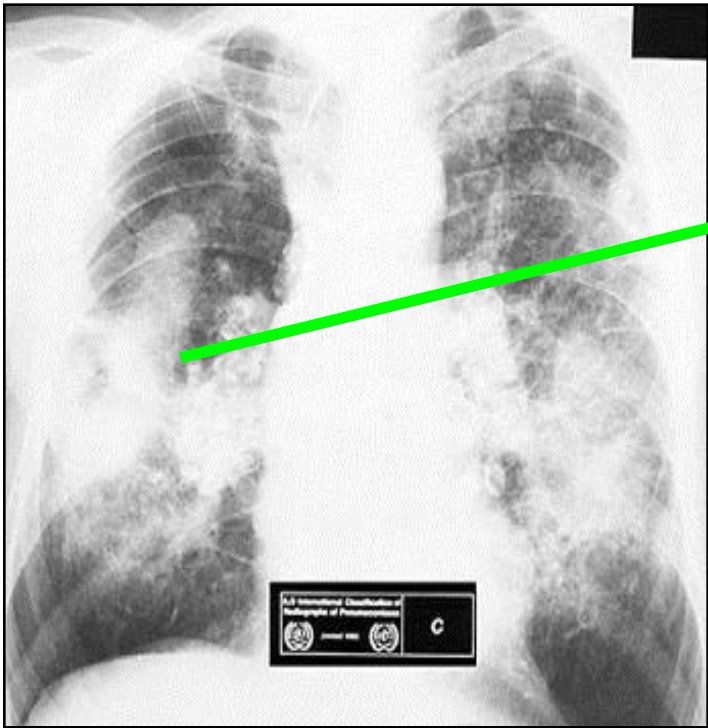


**Coal Worker
Coal Workers' Pneumoconiosis
(CWP)
Black Lung Disease**

Complicated CWP

- Progressive Massive Fibrosis (PMF)
- Fibrous tissue develops in lungs
- Lungs become stiff and cannot expand fully
- Breathing becomes difficult
- Lips and fingernails may have bluish tinge
- Fluid retention and signs of heart failure

Complicated CWP (Progressive Massive Fibrosis)



Respirable crystalline silica (quartz)

- Silica is more toxic than coal (exposure limited to 1/20th that of coal in 1969 Act)
- Freshly fractured silica is more toxic than aged silica
- Smaller particles are more toxic
- Consequences of overexposure:
 - silicosis
 - airways diseases
 - pulmonary tuberculosis
 - chronic renal disease
 - lung cancer

Silicosis

- Chronic
 - occurs after 10 or more years of exposure
 - swelling in lungs
 - troubled breathing similar to COPD
- Accelerated
 - develops in 5 to 10 years
 - symptoms occur faster than in chronic silicosis
- Acute
 - develops in less than 5 years
 - lungs become inflamed and fill with fluid
 - severe shortness of breath and low blood oxygen

Silicosis

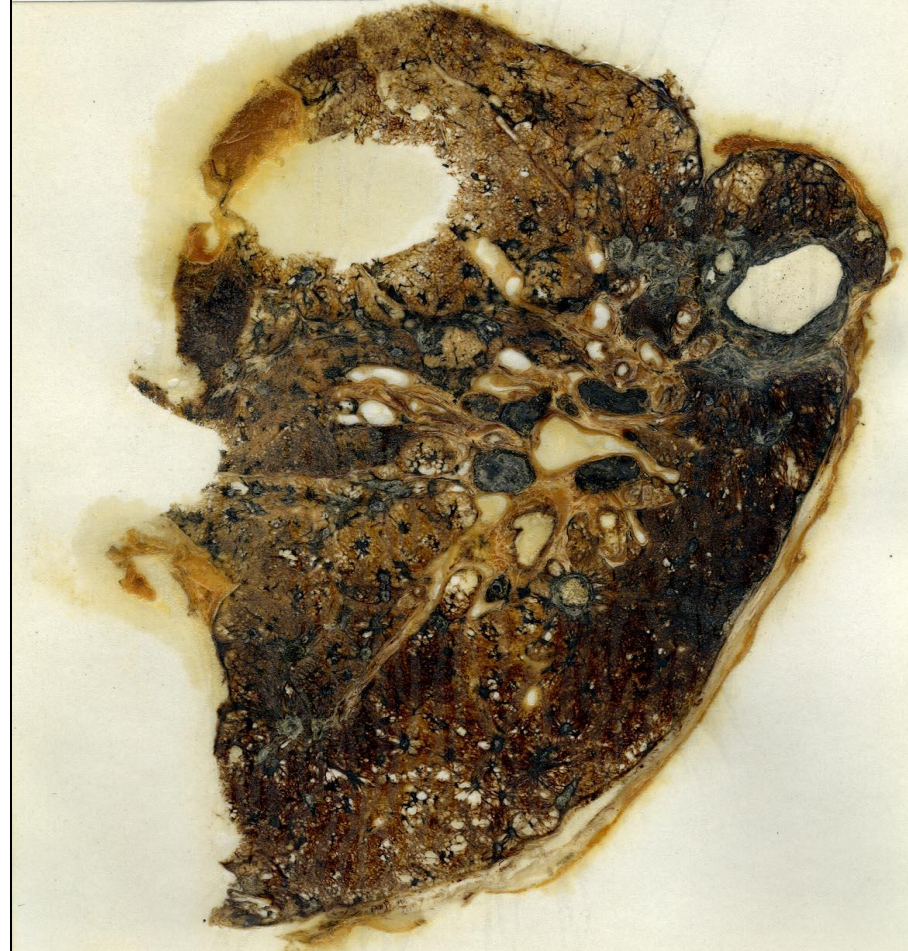
Simple

Section of Freeze-Dried Human Lung
Silicosis



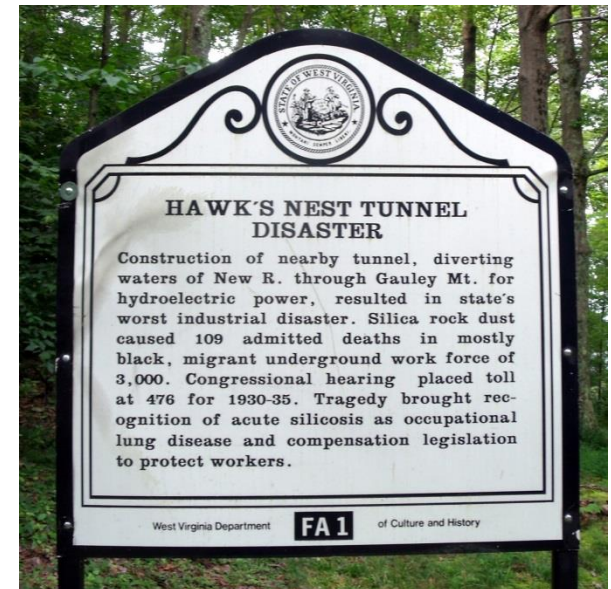
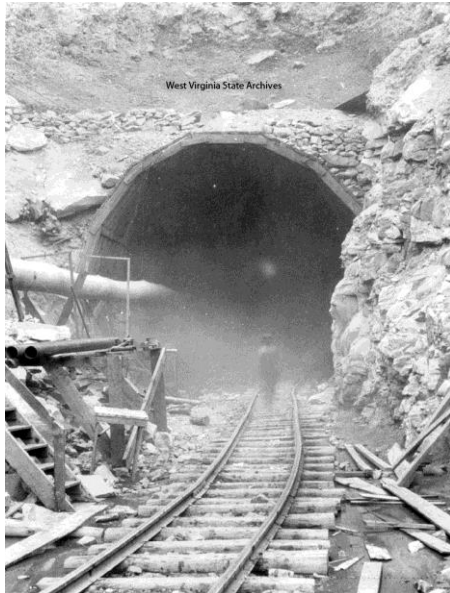
PMF

Section of Freeze-Dried Human Lung
Silicosis



Acute silicosis at Gauley Bridge, WV

- Hydroelectric project near Gauley Bridge, WV (1930-1931)
- Drive a 3-mile tunnel to redirect the New River through the Gauley Mountain
- Sandstone and limestone strata containing high levels of silica
- 476 deaths resulting from acute silicosis

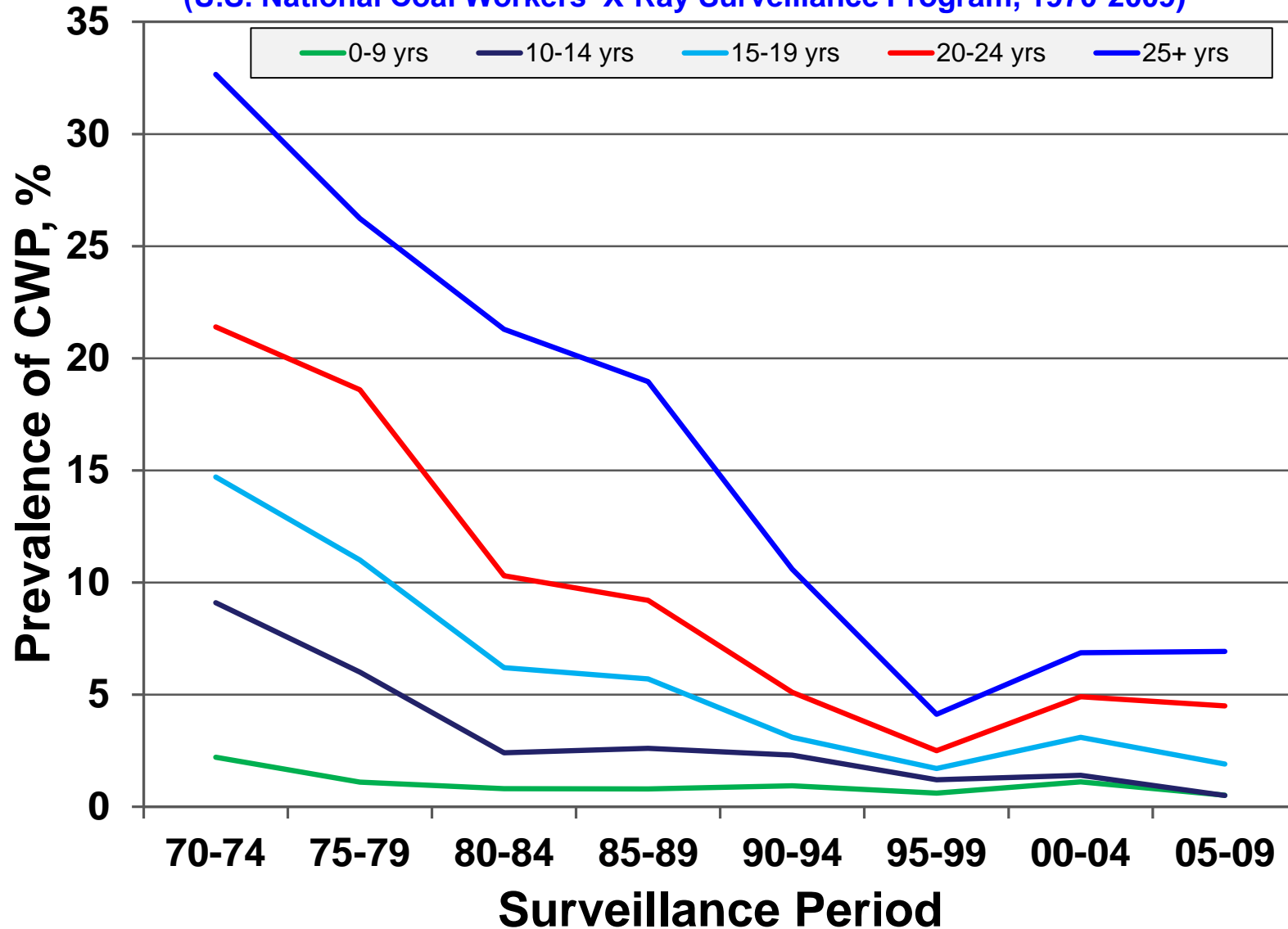


Treatment of CWP/silicosis in coal miners

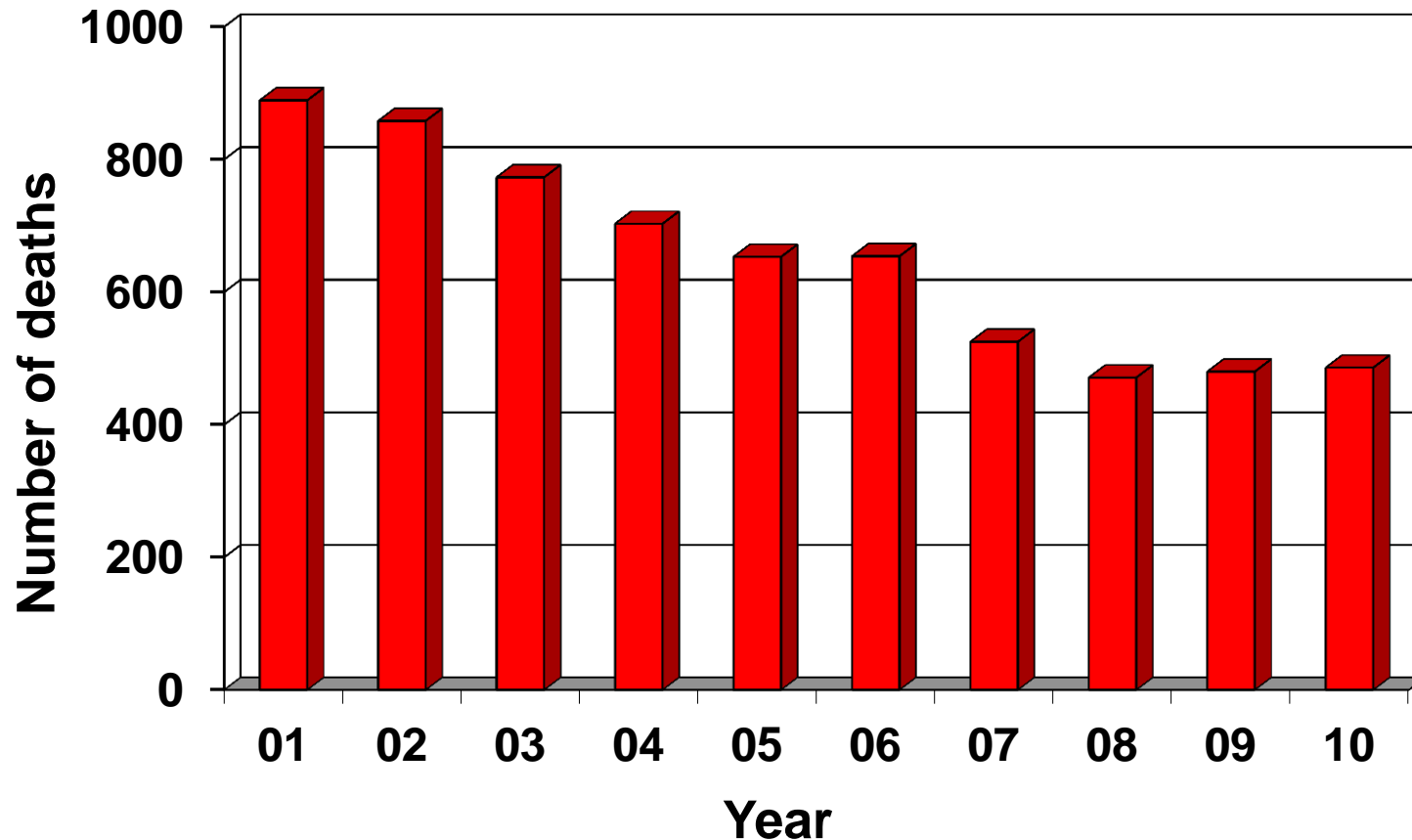
- No medication can reverse dust damage
- Treatment directed at reducing symptoms and prevention of complications
 - vaccines against flu and pneumonia
 - antibiotics for infections and congestion
 - bronchodilators for airway spasm
 - oxygen supplementation
 - treatment for heart failure
- Lung/heart transplant is last resort

CWP prevalence by tenure among examined underground coal miners

(U.S. National Coal Workers' X-Ray Surveillance Program, 1970-2009)



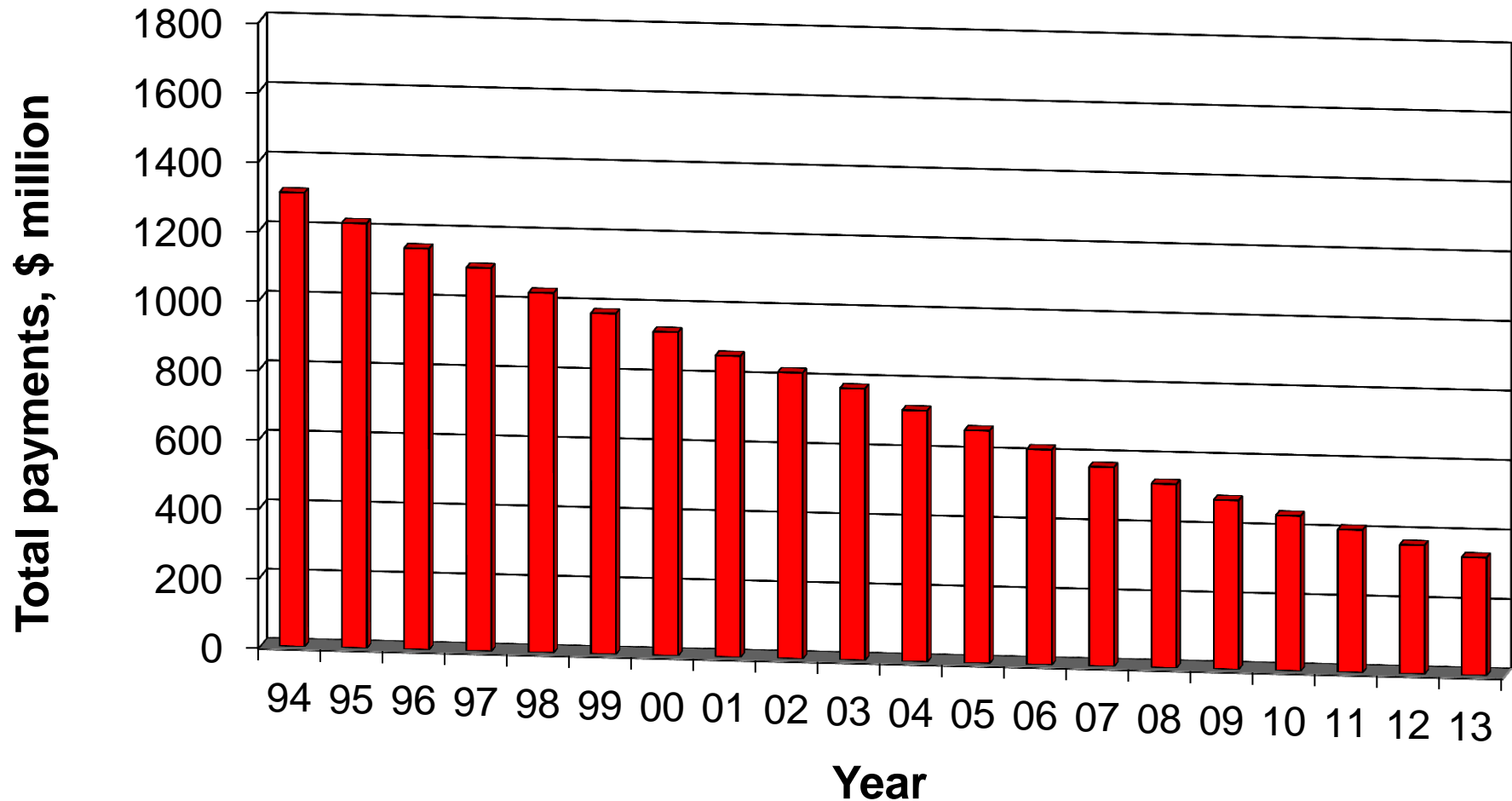
Coal miner deaths with CWP as direct or contributing cause



(total deaths from 1968 – 2010 = 76,464)

Federal Black Lung Benefits Program

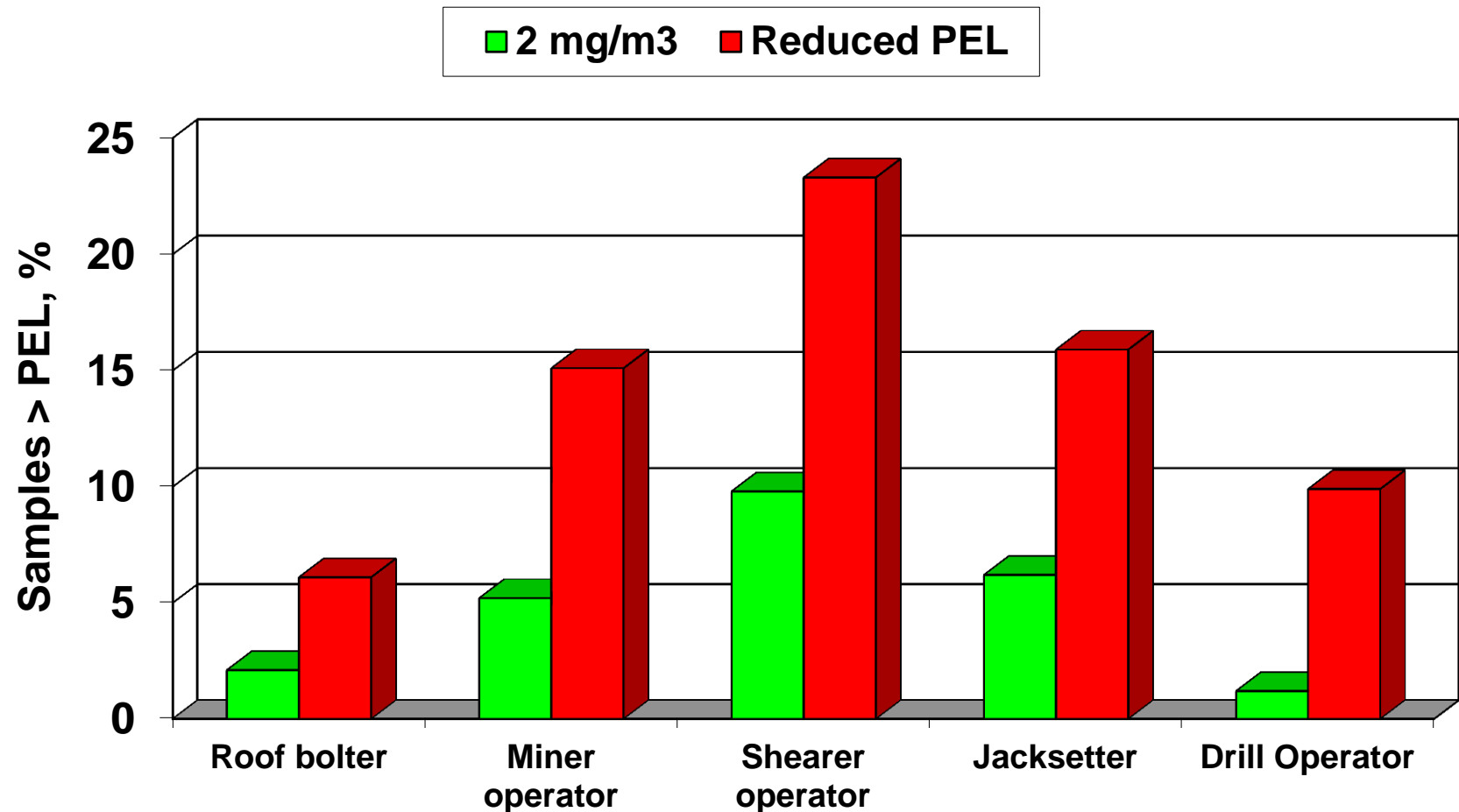
(total payments from SSA and DOL)



(total paid from 1970 – 2013 = \$45.7 Billion)

Overexposures for high risk occupations

(MSHA Compliance Sampling Data from 2007 – 2011)



Enhanced Coal Workers' Health Surveillance Program

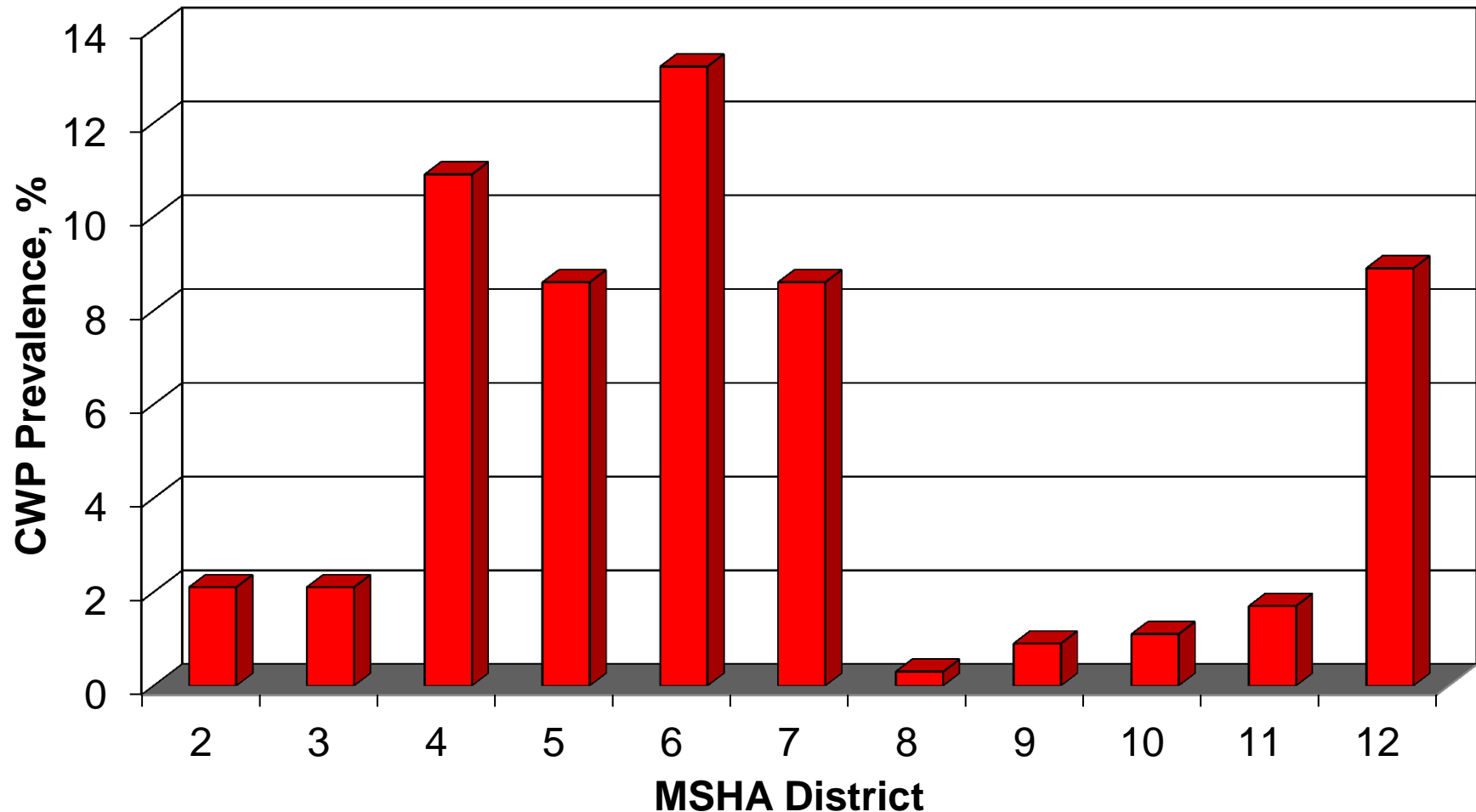
(mobile examination unit travels to mining regions)



- health questionnaires
- work history
- spirometry testing
- chest x-rays



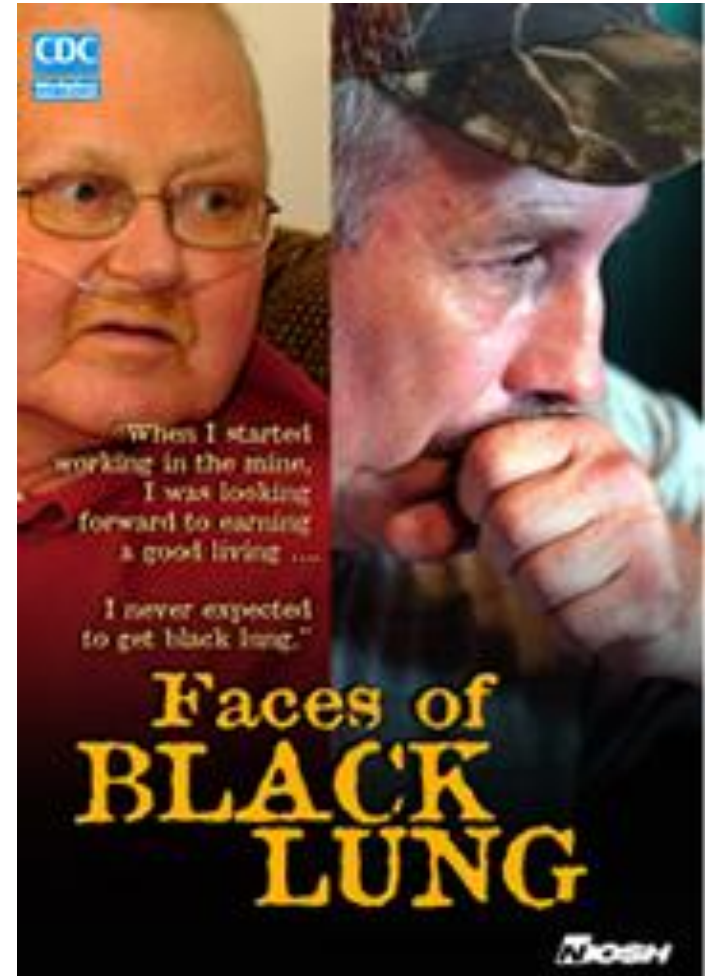
Percent of underground coal miners examined with CWP by MSHA district (CY 2005 – 2009*)



* NIOSH CWHSP data query website at: <http://webappa.cdc.gov/ords/cwhsp-database.html>

Faces of Black Lung DVD

- DRDS interviewed two miners that have contracted CWP
- Miners discuss the importance of protecting themselves from dust exposure
- Copies available from Anita Wolfe (304) 285 - 6263



Website for video: <http://www.cdc.gov/niosh/docs/video/2008-131/default.html>

Faces of Black Lung Video



Important messages.....

Carl Bailey

58 years old.
Worked 28 years in
WV mines, with
most of his work at
the face

“And always remember: What’s on your face you can wash-off, but what’s on your lungs you can’t. So be safe, and take care of yourself .”

Chester Fike

55 years old.
Worked 34 years in mines
in WV and MD and operated
a continuous miner for 27 years.

“I was always trained to avoid injuries and I should’ve paid more attention to the dust.”

Thank you!

Questions??

Jay Colinet
Office of Mine Safety and Health Research
NIOSH
P.O. Box 18070
Pittsburgh, PA 15236

412-386-6825
jcolinet@cdc.gov

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www.cdc.gov/niosh/mining

