

**Advanced Cases of Coal Workers' Pneumoconiosis --- Two
Counties, Virginia, 2006**

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**A Critical Review of the Data Used to
Support the Articles Findings**

AB64-COMM-74-8

Advanced Cases of Coal Workers'
Pneumoconiosis – Two Counties, Virginia, 2006
(Antao, et.al., *MMWR*. August 25, 2006)

Summary

This report describes 11 newly identified cases of advanced coal workers' pneumoconiosis (CWP), including progressive massive fibrosis (PMF), in working coal miners from Lee and Wise counties in southwestern Virginia. PMF is a disabling and potentially fatal form of CWP, an occupational lung disease caused by the inhalation of coal mine dust. The continuing occurrence of advanced forms of CWP emphasizes the importance of comprehensive measures to control coal mine dust effectively and reduce the potential for inhalation exposures in coal mining.

The occurrence of advanced cases of CWP among current miners should be considered a sentinel health event and justifies a comprehensive assessment of current dust-control measures.

Purpose for Reviewing the Antao MMWR Article

- To determine if the results published support the claim of advanced coal workers' pneumoconiosis (CWP), including progressive massive fibrosis (PMF), in working coal miners from Lee and Wise counties in southwestern Virginia.
- Do the results published rise to the level of a Sentinel health event

Public Data Sources Used in Reviewing Article

- Antao et.al. , Advanced Cases of Coal Workers' Pneumoconiosis --- Two Counties, Virginia, 2006
- NIOSH Coal Workers' Health Surveillance Program (CWHSP) Public Data (Antao raw data – CaseStudy.zip)
- NIOSH Coal Workers' Health Surveillance Program (CWHSP) Data Query System
- NIOSH Enhanced Coal Worker's Health Surveillance Program (ECWHSP) --Survey Summaries

Advanced Cases of Coal Workers'
Pneumoconiosis – Two Counties, Virginia, 2006
(Antao, et.al., *MMWR*. August 25, 2006)

Antao, et.al.

Stated his data was the Enhanced Coal Workers' Health Surveillance Program (ECWHSP) survey of Lee & Wise Counties, VA from March and May 2006. A total of 328 (31%) of the estimated 1,055 underground coal miners currently employed were tested.

Miners Examined = 328

Miners with ax = 11

PMF Stage O = 322

PMF Stage A = 3

PMF Stage B= 3

PMF Stage C=0

**NIOSH Enhanced Coal Workers' Health Surveillance
Program (ECWHSP) – Survey Summary**

Site surveys were done on location in Lee & Wise counties, Virginia during March and May 2006. Of those 1,091 employed, there were 328 examined for a participation rate of 30%.

Miners Examined = 328

Miners with ax = 14

PMF Stage O = 326

PMF Stage A = 0

PMF Stage B= 2

PMF Stage C=0

All data should be exactly the same. Discrepancies found in the number of miners employed, and number of miners identified with ax and Stages of PFM.

Advanced Cases of Coal Workers'
Pneumoconiosis – Two Counties, Virginia, 2006
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TABLE 1. Age and tenure characteristics of 11 miners with advanced cases of coal workers' pneumoconiosis — Lee and Wise counties, Virginia, 2006

Miner	Age (yrs)	Year began coal mining	No. of years coal mining	No. of years working at coal face*
1	62	1963	43	33
2	61	1966	40	30
3	57	1970	36	36
4	52	1973	33	33
5	52	1973	33	33
6	54	1973	33	33
7	52	1974	32	29
8	46	1979	27	27
9	45	1981	25	25
10	42	1981	24	24
11	39	1989	17	17

* The cutting surface where coal is sheared from the wall and dust levels typically are greatest.

Miner identified as #2 in the table was not found in the raw database (CaseStudy.zip). All others were matched up with coded data.

Advanced Cases of Coal Workers' Pneumoconiosis – Two Counties, Virginia, 2006 (Antao, et.al., *MMWR*. August 25, 2006)

TABLE 2. Clinical characteristics of 11 miners with advanced cases of coal workers' pneumoconiosis (CWP) — Lee and Wise counties, Virginia, 2006

Miner	Year of radiograph*	Radiographic characteristics			Respiratory symptoms	Spirometry results
		Small opacity production category†	Large opacity category‡	Other abnormalities		
1	1977	0/0	—	—	Productive cough, wheeze, and dyspnea	Normal
	1994	0/0	—	—		
	2000	0/1	—	—		
	2006	2/2	—	ax [§]		
2	1974	0/0	—	—	Mild dyspnea	Obstruction¶
	1995	0/1	—	—		
	2002	0/0	—	—		
	2006	1/2	A	ax		
3	1974	0/0	—	—	Dyspnea	Normal
	2001	2/1	—	—		
	2006	2/0	—	ax		
4	1974	0/0	—	—	Wheeze and dyspnea	Normal
	1980	0/0	—	—		
	1982	0/0	—	—		
	2001	1/2	—	—		
	2006	2/2	—	ax		
5	1980	0/1	—	—	Productive cough, wheeze, and dyspnea	Obstruction
	2006	2/3	A	ax		
6	1980	0/0	—	—	Productive cough, wheeze, and dyspnea	Normal
	1982	0/1	—	—		
	2002	2/1	—	—		
	2003	1/2	—	—		
	2006	2/2	—	ax		
7	1974	0/0	—	—	Wheeze	Restriction**
	1975	1/2	—	—		
	2002	1/2	—	—		
	2006	2/2	—	ax		
8	1992	0/0	—	—	Productive cough and dyspnea	Not available
	2002	2/1	—	—		
	2006	2/2	B	ax		
9	2000	0/0	—	—	Productive cough, wheeze, and dyspnea	Normal
	2001	1/1	—	—		
	2004	1/2	A	—		
	2006	1/2	B	ax		
10	1967	0/0	—	—	Productive cough, wheeze, and dyspnea	Not available
	1995	0/0	—	—		
	2006	2/3	—	ax		
11	1992	0/0	—	—	Cough and dyspnea	Restriction
	2006	1/2	B	ax		

* Under current federal regulations, mine operators are required to offer a radiograph, free of charge, to each underground miner when hired and again at 3 years and to offer radiographs to all continuing underground miners once every 5 years.

† The International Labour Office classification categorizes the production of small opacities by comparing with standard radiographs using a 12-point scale from 0 (=normal) to 3 (= greatest) and the presence and density of large pneumoconiotic opacities (i.e., progressive massive fibrosis [PMF]) to stage A (least severe PMF), B, or C (most severe PMF).

‡ Classification of small opacities (4).

§ Ratio of forced expiratory volume in 1 sec (FEV₁)/forced vital capacity (FVC) is less than the lower limit of normal (LLN) and FVC is greater than or equal to LLN. ¶ Obstruction typically results from airway diseases such as asthma, chronic obstructive lung disease, or emphysema.

** FEV₁/FVC is greater than LLN and FVC is less than LLN. Restriction typically results from scarring and inflammatory diseases of the lung tissue, such as pulmonary fibrosis or CWP.

Miner identified as #2 in the table was not found in the raw data (CaseStudy.zip). All others were identified with coded data.

This table was constructed using the Antao CaseStudy.zip file downloaded from NIOSH

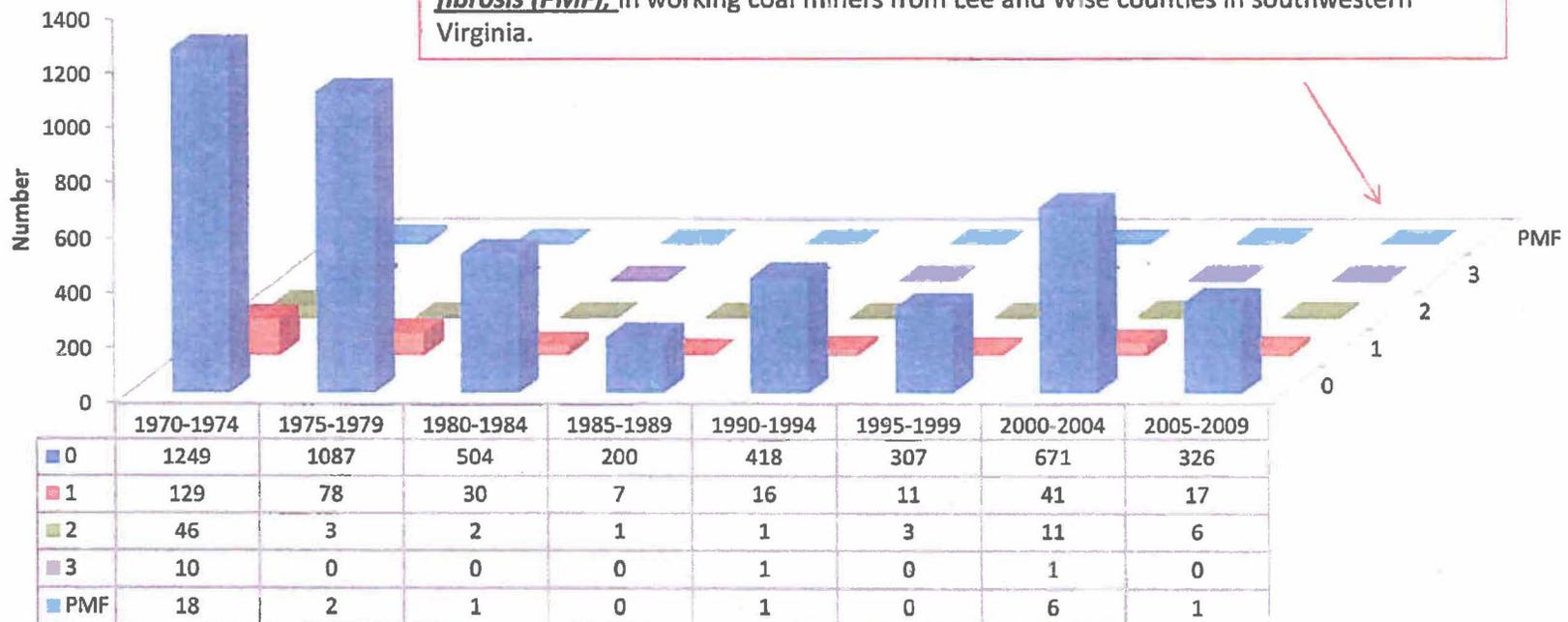
Miners (XRay_Group) Identified with Coalescence of Small Opacities (ax)							
xray_year	XRAY_GROUP	AGE_GROUP	MINING_TENURE_GROUP	FACE_TENURE_GROUP	STAGE_FOR_ANALYSIS	CATEGORY_FOR_ANALYSIS	AX_IND
2006	49	50	30	30	O	2/2	YES
2006	59	50	30	20	O	2/2	YES
2006	80	50	30	30	O	2/3	YES
2006	89	60	30	30	O	2/2	YES
2006	110	50	30	30	A	2/3	YES
2006	114	50	30	30	O	2/2	YES
2006	121	40	20	20	O	1/2	YES
2006	133	40	20	20	O	2/3	YES
2006	161	30	10	10	B	1/2	YES
2006	163	40	20	20	B	2/2	YES
2006	185	50	30	30	O	1/2	YES
2006	189	40	20	20	B	1/2	YES
2006	201	40	20	20	O	1/2	YES
2006	244	50	30	20	O	1/1	YES
2006	292	50	30	30	O	0	YES

- Yellow highlighted rows indicate data selected for presentation in the Antao MMWR article. Non-highlighted rows were not included in the published article
- Miner identified as #2 in the table was not found in the raw database (CaseStudy.zip). All others were matched up with coded data.

NIOSH Coal Workers' Pneumoconiosis in Lee & Wise Counties, Virginia 1970-2009

Source: NIOSH CWHSP Data Query System

*Antao et al., [Advanced Cases of Coal Workers' Pneumoconiosis – Two Counties, Virginia, 2006](#) (MMWR. August 25, 2006 / 55(33);909-913). report describes 11 **newly** identified cases of **advanced coal workers' pneumoconiosis (CWP), including progressive massive fibrosis (PMF)**, in working coal miners from Lee and Wise counties in southwestern Virginia.*

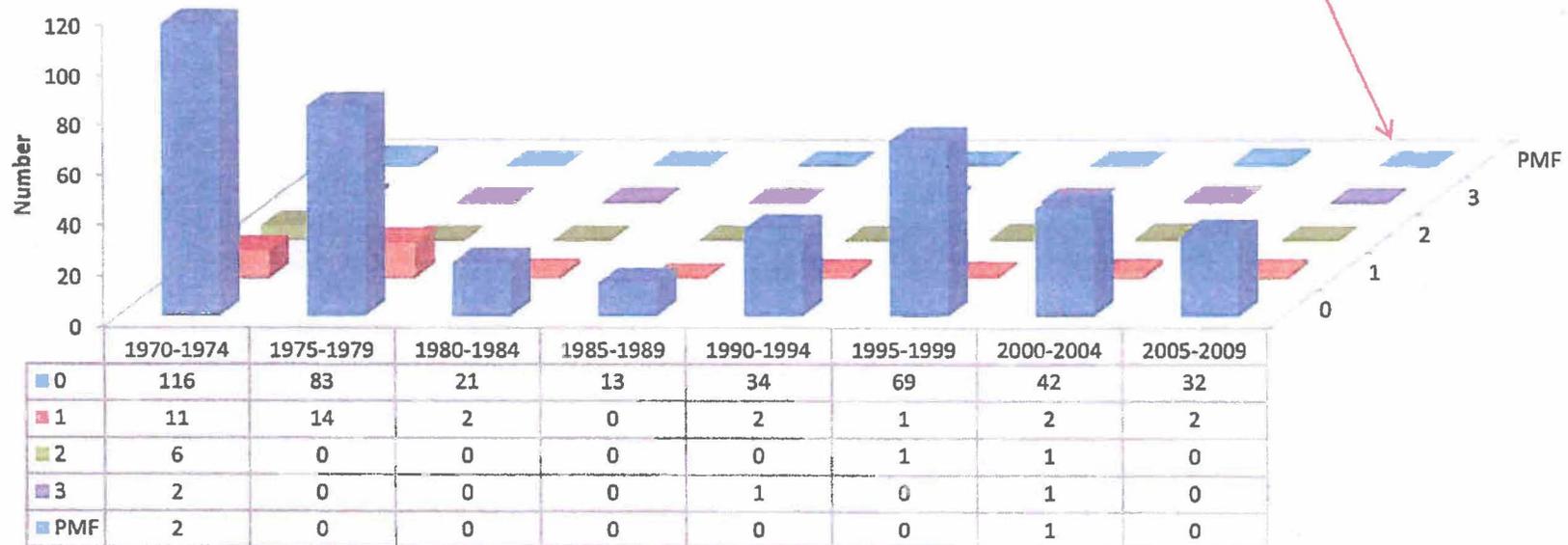


***This chart was constructed using the recently released NIOSH CWHSP Data Query System
Analysis of this public data does NOT support Antao's claim of Advanced CWP and PMF***

NIOSH Coal Workers' Pneumoconiosis in Lee County, Virginia 1970-2009

Source: NIOSH CWHSP Data Query System

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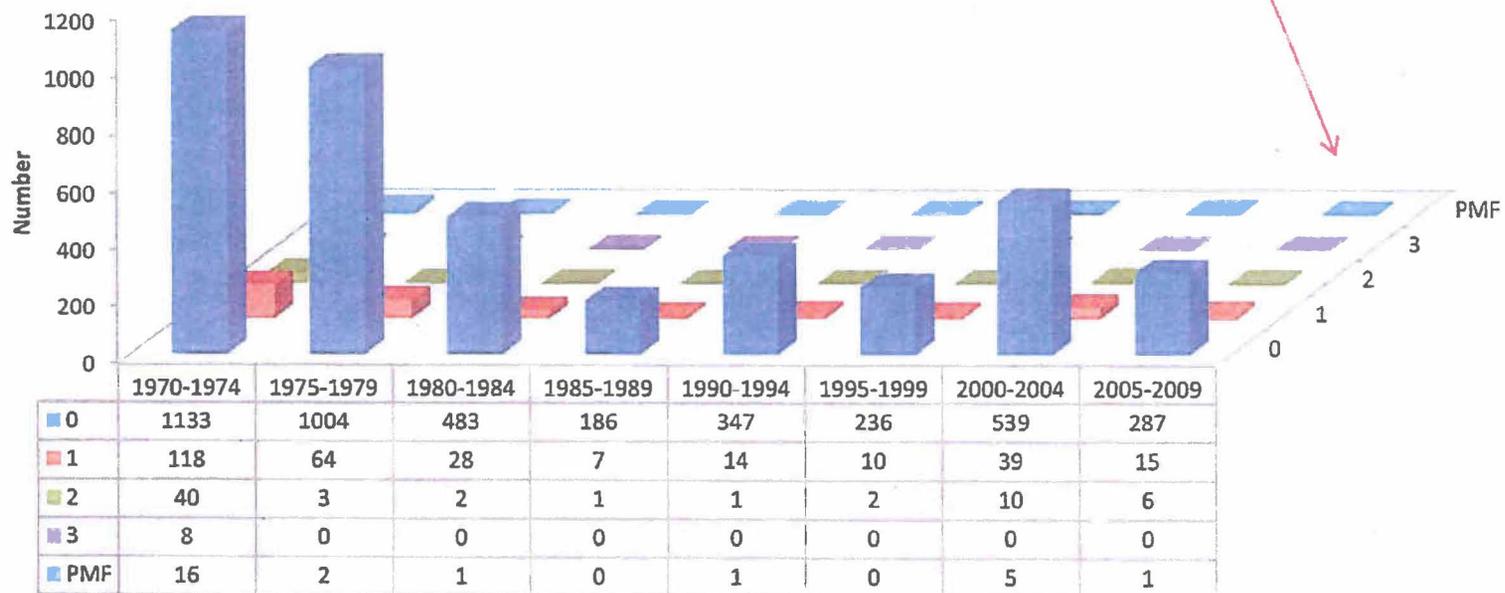


*This chart was constructed using the recently released NIOSH CWHSP Data Query System
Analysis of this public data does NOT support Antao's claim of Advanced CWP and PMF*

NIOSH Coal Workers' Pneumoconiosis in Wise County, Virginia 1970-2009

Source: NIOSH CWHSP Data Query System

*Antao et.al., Advanced Cases of Coal Workers' Pneumoconiosis – Two Counties, Virginia, 2006 (MMWR. August 25, 2006 / 55(33);909-913). report describes 11 **newly** identified cases of **advanced coal workers' pneumoconiosis (CWP), including progressive massive fibrosis (PMF)**, in working coal miners from Lee and Wise counties in southwestern Virginia.*



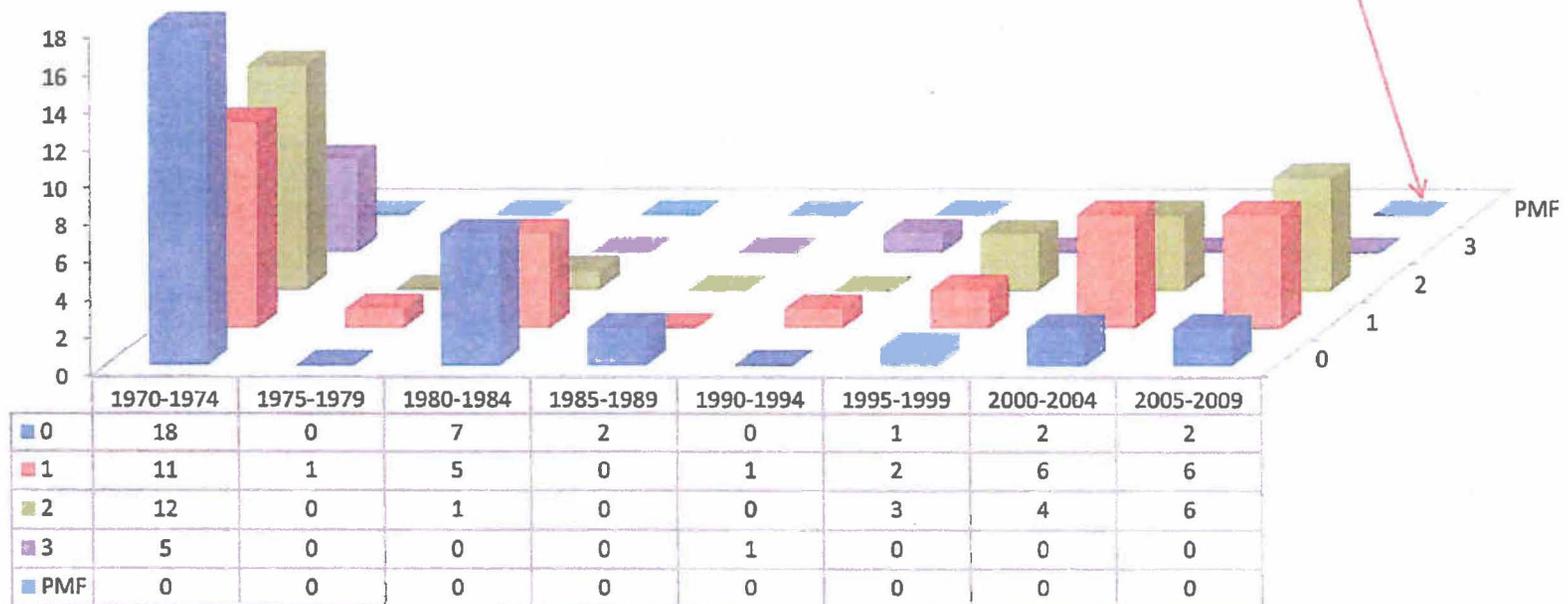
*This chart was constructed using the recently released NIOSH CWHSP Data Query System
Analysis of this public data does NOT support Antao's claim of Advanced CWP and PMF*

NIOSH Coal Workers' Pneumoconiosis in Lee & Wise Counties, Virginia 1970-2009

Coalescence of Small Opacities (ax)

Source: NIOSH CWHSP Data Query System

Antao et al., Advanced Cases of Coal Workers' Pneumoconiosis – Two Counties, Virginia, 2006 (MMWR. August 25, 2006 / 55(33);909-913). report describes 11 newly identified cases of advanced coal workers' pneumoconiosis (CWP), including progressive massive fibrosis (PMF), in working coal miners from Lee and Wise counties in southwestern Virginia.



*This chart was constructed using the recently released NIOSH CWHSP Data Query System
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Review findings

- Information posted on the NIOSH website for the ECWHSP surveys in Lee & Wise counties during March and May 2006 does not match the data published by Antao . Antao et.al., stated he used the ECWHSP survey data.
- ECWHSP examined 328 miners in Lee & Wise counties. Of those 328, only 266 miners were included in Antao's database (CaseStudy.zip) with no explanation of the results for the remaining 62 miners. With no explanation, it is therefore assumed that those 62 (19%) had x-rays that could not be classified because of poor film quality.
- Using the recently released NIOSH CWHSP data query system, only 1 case of PMF was observed in Lee or Wise counties from 2005-2009. Furthermore, from 1970 only 29 miners were identified as having PMF. Of the 328 miners examined, Antao identified 6 PMF cases but only 5 of those cases were found in the raw data (CaseStudy.zip)
- Of the 328 miners examined, 15 miners were identified as having coalescence of small opacities (ax) on x-ray. In his publication, Antao only included 11 of those 15 miners having ax. Miner #2 identified on Table 1 & 2 as having ax and PMF could not be found in the raw data (CaseStudy.zip)

Review findings continued:

- Coalescence of small opacities (ax) on x-rays have been identified in Lee & Wise counties dating back to 1970. During the time period 2000-2004, ax was identified on 12 x-rays. Yet in 2006, Antao described the 11 identified cases of ax he saw in Lee & Wise counties as a sentinel health event (SHE) of advance disease.
- The NIOSH query system shows that during the time period of 2005-2009, 350 x-rays were submitted to NIOSH from miners in Lee & Wise counties as part of the CWHSP. Of those 350 film, 328 were solicited on miners by the Enhanced Coal Workers' Health Surveillance Program (ECWHSP) during their March and May 2006 surveys.
- From 2005-2009, only 22 unsolicited x-rays were submitted to the NIOSH CWHSP from miners in Lee & Wise counties which results in less then 6 x-rays per year from this region. Low participation results in data bias from a "healthy worker effect" .

Review findings continued:

- The healthy worker effect can also be seen in the data Antao presented in his MMWR article. Table 2 from the Antao article shows 8 of the 11 miners he reported on had multiple x-ray taken since 2000, some as many as many as 3 x-rays in a very short time period.
- Table 2 also shows the variability of B Readers. One of the 11 miners in the Antao article had one x-ray classified as 2/1 in 2002, 1/2 in 2003, and finally 2/2 with ax in 2006. The Antao data (CaseStudy.zip) has 31 other occurrences of film read 1/0 or > then 0/0 on subsequent x-rays.

Conclusions:

- A critical review of the Antao MMWR article indicate a very selective use of the overall data collected; and therefore, should not be relied upon as the principal indication of advanced coal workers' pneumoconiosis (CWP), including progressive massive fibrosis (PMF), in working coal miners from Lee and Wise counties in southwestern Virginia.
- The NIOSH Data Query System is a useful tool for public use and has only recently become available for anyone outside of the CWHSF to look at CWP data. This is a good first start in becoming transparent in the data once held so narrowly.
- By referring to these results as a sentinel health event, Antao and NIOSH were careless and in their use of terminology and failed to consider historical data in their analysis. A review of the historical data by NIOSH would have revealed that Antao's result did not meet the standard of a sentinel health event. At best, Antao's results should have only been use as a preliminarily indication and a more formal, controlled epidemiological studies designed by NIOSH to determine if in fact advanced CWP disease was increasing in the region.

Conclusions continued:

- It is unacceptable if 62 (19%) miner x-rays were excluded by Antao and NIOSH because of poor film quality. If this is the case, NIOSH needs to present that data and explain how the poor film quality was addressed and corrected. An x-ray quality control program should be developed to ensure readable film. CWHSP participation is already low, but to have miners show up to the ECWHSP van for evaluation only to have their film unreadable doesn't bolster good future participation. Regardless, NIOSH needs to explain why 62 miners (19%) were excluded from the Antao's analysis.
- Three published papers by NIOSH were used by MSHA as the impetus for their proposed respirable dust rule change. This one review of the Antao article has raised a number of scientific, as well as ethical, issues that call into question the validity of the Antao results. But more importantly, the sloppy data interpretation from the Antao article raises significant cynicism for all the NIOSH data used to determine "Hot Spots" (which include both Lee and Wise counties, Virginia).