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MERETRICIOUS EFFECTS OF COAL DUST

To the Editor :

The paper by Beeckman and colleagues purports to show increases in respiratory and cardiac illness and mortality in U.S. coalminers (1). The authors selected two groups of coalminers, one of which had an excess decline in the FEV_1 (310 cases), whereas the second was relatively stable (324 referents). FEV_1 measurements were performed every 5 yr for 6 to 18 yr, starting in 1977 and ending in 1988. The decline relied on the first and last FEV_1.

The data are not credible, particularly those in Table 6. Male nonsmokers over 35 yr have an annual decline in FEV_1 of 27 to 33 ml, and in FVC of 23 to 27 ml (1). As a result, the FEV_1/FVC% decreases with age. The annual FEV_1 decline in the cases ranged from 87 ml in those lost to follow up, to 91.9 ml in those alive, and to 106.5 ml in those dead, and for the referents were, respectively, 2.9 ml, 4.8 ml, and 7.9 ml. The decreases in the FVC for the cases were 101.7 ml, 103.5 ml, and 111.7 ml, and for the referents were 0.5 ml, 16.6 ml, and 22.2 ml. The FEV_1/FVC% showed a decline of less than 1% in the cases and a small increment in the referents. These data are physiologically impossible. Although the FEV_1 cases show an excessive decline, the FVC declines even more rapidly. The FVC, when expressed as a percentage of predicted, cannot vary more than ±3 to 4% than the predicted FEV_1.

In regard to smoking habits of the cases, 24.8% were said to be smokers, 50.4% exsmokers, and 24.8% nonsmokers, whereas the figures for the first round of the National Coal Study (NCS) were 54.4%, 25.5%, and 20.1% (4).

Beeckman and colleagues suggest that coalminers are predisposed to develop respiratory symptoms and heart disease, leading to increased mortality. A series of prospective studies from the U.S. and Britain were carried out between 1960 and 1975. These relied upon the follow up of randomly selected cohorts of miners in Britain and Appalachia (5). Many were carried out by NIOSH and included miners who had worked between 1940 and 1970, when the dust levels were 4 to 15 times higher than they are now (5). It was evident that complicated pneumoconiosis was associated with premature death, as was smoking; however, simple coalworkers' pneumoconiosis was not. In nonsmokers, the standardized mortality ratio was between 70 and 80 and sometimes lower. In Britain and the U.S., the life expectancy of coalminers was similar to that of the general population, except in cases of heart disease and lung cancer. These occurred less frequently, since miners smoke fewer cigarettes. Foxman and colleagues studied a group of miners, foundry workers, mixed dust and chemical workers, and nondust exposed workers in Staveley, England (6). All-cause mortality was similar in the nondusty, foundry, and mixed dust groups, but was slightly lower in the miners and ex-

miners. It is difficult to reconcile these findings with the findings of Beeckman and colleagues, especially in view of the reduction of the dust levels in U.S. and British coal mines.

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1. Beeckman LF, Wang M-L, Petsonk EL, Wagner GR. Rapid declines in FEV_1 and subsequent respiratory symptoms, illnesses, and mortality in coal miners in the United States. *Am J Respir Crit Care Med* 2001; 163: 633-639 [Abstract/Free Full Text].

2. Fletcher CM, Peto R, Tinker C, Speizer FE. The natural history of chronic bronchitis. Oxford, UK: Oxford University Press; 1976. p. 70-105.

3. Tager IB, Segal MR, Speizer FE, Weiss S. The natural history of forced expiratory volumes: effect of smoking and respiratory symptoms. *Am Rev Respir Dis* 1988; 138: 837-849 [Medline].

4. Kibelstis JA, Morgan EJ, Reger R, Lapp NL, Seaton A, Morgan WK. Prevalence of bronchitis and airway obstruction in American bituminous coal miners. *Am Rev Respir Dis* 1973; 108: 886-893 [Medline].

5. Morgan WKC, Lapp NL. Respiratory disease in coal miners. *Am Rev Respir Dis* 1976; 113: 531-559 [Medline].

6. Foxman B, Higgins ITT, Oh MS. The effects of occupation and smoking on respiratory disease mortality. *Am Rev Respir Dis* 1986; 134: 649-652 [Medline].

From the Authors:

Dr. Ahmad and colleagues raise concerns about credibility of our data and thus the findings of our study (1). We analyzed spirometry data collected between 1970 and 1988, during the National Study of Coal Workers Pneumoconiosis (NSCWP). All equipment, training, and quality assurance procedures equaled or exceeded those of contemporaneous studies. In fact, the experience gained during the NSCWP was of great value in developing the American Thoracic Society Statement on "Standardization of Spirometry" (2).

Ahmad and colleagues find it a challenge to understand the differences observed between mean declines reported from studies of healthy, nonsmoking, non-dust-exposed persons and the FEV_1

declines in our study. The two miner subgroups were carefully matched for smoking status, initial age and height, and baseline FEV_1. They were selected specifically because they had demonstrated rates of ventilatory decline that were either high (cases) or low (referents). Thus, it was an expected consequence of the study design that the case group would have high rates, and the referent group low rates of FEV_1 decline. An important goal of our study was to investigate the consequences of FEV_1 declines at the high versus the low ends of the distribution observed among miners.

Ahmad and colleagues believe data reported in Table 6 "are physiologically impossible." We disagree. Changes over time in FEV_1/FVC ratios depend on the actual baseline value of each component of the ratio and the changes observed in each component. Proportional changes in both values result in little change in the ratio. This was the situation observed among the cases in our study who experienced a small longitudinal decrement in average FEV_1/FVC. Combined restrictive and obstructive impairments are commonly noted in studies of miners, and several longitudinal studies of coal miners have shown concentric losses in FVC and FEV_1 (3, 4).

The differences in smoking status between our study subjects and the entire group of participants in the first round of the NSCWP are explained by study inclusion criteria. To be included in this study, miners were required to have consistent smoking habits over the interval for which lung function changes were measured. Since smoking among miners declined after the NSCWP, smoking status in our paper reflects the follow-up health survey rather than the first round of the NSCWP.

Dr. Ahmad and colleagues have difficulty reconciling results of several previous mortality studies of coal miners with our findings. We do not. These earlier studies compared the mortality experience of coal miners with that of the general population. Our report (1) compared the mortality experience of miners with sustained rapid declines in lung function to that of miners with relatively stable lung function, without reference to the general population.

Our study extends understanding of the health consequences of dust exposures. The results should alert health care providers that coal miners who experience excessive declines in FEV_1 over prolonged periods are at higher risk of developing respiratory tract symptoms and illnesses, and are more likely to die from cardiovascular and respiratory causes than coal miners with relatively stable lung function.

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1. Beeckman LF, Wang M-L, Petsonk EL, Wagner GR. Rapid declines in FEV_1 and subsequent respiratory symptoms, illnesses, and mortality in coal miners in the United States. *Am J Respir Crit Care Med* 2001; 163: 633-639 [Abstract/Free Full Text].

2. American Thoracic Society. Standardization of spirometry. *Am Rev Respir Dis* 1979;119:831-838.

3. Attfield MD, Hodous TK. Pulmonary function of U.S. coal miners related to dust exposure estimates. *Am Rev Respir Dis* 1992; 145: 605-609 [Medline].

4. Pern PO, Love RG, Wightman AJA, Soutar CA. Characteristics of coalminers who have suffered excessive loss of lung function over 10 years. *Bull Eur Physiopathol Respir* 1984; 20: 487-493 [Medline].
