CORRESPONDENCE

Respiratory health effects of opencast coalmining: a cross-sectional study of current workers

EDITOR,—We are writing to comment on the manuscript by Love et al on the respiratory health effects associated with opencast mining in the United Kingdom.

Firstly, several years ago, we reported the dangers of surface mining in the United States. Although the general consensus had been that employment as a surface miner was nearly without risk, we identified the very serious risk for aggressive pneumoconiosis in surface drillers and driller helpers. A review of our recent clinical experience has shown that the most severe cases of pneumoconiosis in West Virginia are most often associated with surface mining. We are interested in the prevention of any such bias in all groups (primarily the preproduction group), the jobs of the miners with advanced pneumoconiosis, and the relation between workers with pneumoconiosis and exposures in other dusty jobs. Nationally, Table 3 of the report does not do the authors tell us the prevalence of pneumoconiosis in the various occupational groups. Without these data, we cannot judge the degree of adverse respiratory risk for the specific jobs in opencast mines. This is especially relevant to the cases of advanced pneumoconiosis, particularly the two cases of progressive massive fibrosis. Similarly, this lack of information affects the validity of the authors' recommendations for additional screening for process workers (a term undefined in the text). We think that, because of the way that these data have been presented, the authors have not provided evidence which would justify screening of these workers.

Secondly, in the abstract, the authors note the risk for pneumoconiosis or decreased lung function was no greater in those opencast miners who had other exposures in the dusty occupations. In view of these data, it remains unclear why the authors did not exclude the 400 men who had worked in previous dusty jobs and focus entirely on workers with opencast mining exposure only. This is especially important as there were twice as many subjects with external dusty exposure as in the preproduction group, the group described as having a considerable number of workers with positive radiographic findings. Frankly, including these 400 miners in the cohort makes it impossible to define the number of miners with pneumoconiosis due to opencast mining with the authors' statistical approach.

The goal of any study is to build a statistical model that is applicable to the population of interest. We believe that our stated research question is of major importance and relevance to opencast workers. The health effects of different dust exposures are likely to differ in various dusty occupations. Therefore, we believe that a statistical model which includes all exposures must be used to estimate the risk factors associated with pneumoconiosis.

Thirdly, Table 3 is not helpful without knowledge of the duration of dust exposure or the relation between the development of pneumoconiosis and the history of employment in other dusty jobs (especially employment as an underground miner).

Fourthly, the interpretation of Table 6 is unclear. The authors label Table 6 as predicting the risk for profile category 0 or greater; however, in the model the authors predict the risks for developing category 0 or greater (see the text adjacent to this table). Is this an error, or did the authors use different criteria?

The authors believe the miners had pneumoconiosis of category 0 or greater (4% category 0/1 and 4% category 1/0 or greater). Yet, the results from the model reported in Table 6 shows a 3.6% prevalence of radiographic films with profusion category 0 (1/0?) in non-smoking workers and 11.0% for current smokers with zero years of exposure at age 45, and 4.1% positive for profusion category 0/1 (or 0/0?) for non-smokers and 23.4% positive for smokers at age 55. How can these miners have category 0/1 (or 0/0?) before they had any years of exposure, or do these values only reflect variation in chest radiographic interpretation by the readers? If so, the amount of variability in the readings (recognised to be false positive) approximately the number described to have disease.

The authors extrapolate the effects of exposure in preproduction for 10 and 20 years into the future, based upon a mean of 6.9 years of exposure (data from Table 1). Although the maximal duration of employment was 36 years in preproduction, a mean of 6.9 years is unlikely for workers with 6 years exposures exceeding 10 years. In view of the relatively brief mean duration of exposure and the many apparently false positive radiographs at profusion category 0/1, how accurate is this prediction likely to be?

In summary, this is an interesting study of the respiratory health of opencast miners, but it seems that there are an insufficient number of men in the cohort with exposure to other dusty jobs to determine the risk of employment in the different jobs within this industry. If the data are sufficient to define the risk of employment, we ask that it be presented in a different manner, so that the risk of working in these jobs in the United Kingdom can be evaluated and better support the recommendations made to monitor the opencast miner's respiratory health.

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4. Authors’ reply—we thank Banks et al for their interest in our paper. They make several comments, and we are glad of the opportunity to reply to these.

Banks et al suggest that we should present figures representing prevalence in the various jobs in the industry, by which they presumably mean the jobs current at the time of the survey. There are two problems with this approach: men move between jobs; and the contribution to risk of working in a particular job is likely to be related to duration of service in that job. Because of these complications, we sought to characterise risk in relation to full occupational histories taken at survey, a standard epidemiological approach which has proved fruitful in many of our studies. Our stated research objectives, and our presentation of the results, reflected this approach. The detailed exposure data presented in our figure (p 419) and in our tables show that measurement of cumulative exposure could vary widely within occupational groups, but that important contributions to cumulative exposure might be experienced in several of these groups.

The people within our data set varied in age and smoking habits, and had varied durations of exposure in different occupations. Regression methods are standard techniques for analysing such data, because they can both separate the simultaneous effects of explanatory variables, and measure the degree of any confounding among them (although Banks et al seem to question these abilities).

We based our conclusions on a careful appraisal of logistic regression fits, because we were fitting several combinations of variables. In individual people, of course, it is usually difficult or impossible to ascribe the contributions of different factors to overall risk; but we did not attempt this. We confirm that our study was epidemiological, not clinical; and that the film readers were all experienced in their allotted task, the application of the International Labour Organisation classification for the standardised description of radiographic findings or normalities. We used the median of their readings of profusion, and attempted to maintain the important distinction between subjective contributions characterising radiographs which were judged to show small opacities, and (being diagnosed as) having pneumoconiosis. Because we did not attempt to diagnose, we did not consider subjects with small opacities but those with little exposure to be false positives: the influence of age and smoking on small opacities are well known.

Banks et al express concern that our results may reflect exposures outside the opencast mining industry. We stated that our analysis showed no relation with time worked in underground mining or other dusty employment, and we have reported elsewhere that exclusion of 198 men who had previously worked as underground miners did not substantially alter the estimates of risk related to opencast working. None of the six men with category 2 small opacities or large opacities had worked at any time as an underground coalminer.

We are confident that our stated findings of an association between increased risk of mostly mild) radiographic abnormalities and time worked in the dusty, preproduction jobs in the industry, after adjusting for smoking habits, are not due to confounding with other occupational risks. Our findings are consistent with the clinical observations and epidemiological film readings of Banks et al in drillers, who are included in our preproduction occupational group. We summarised our fitted regression models by showing, in Table 6, average age risks of showing small opacities >0/1 predicted (although not in the sense of “in the future”) by the model for various parameters of

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age, smoking, and time worked in prereproduction occupations. Uncertainty in these predicted averages is measured as standard errors, which are also given in the table. We are grateful to Banks et al for spotting the typographic error in the title of table 6, which wrongly implies that the response was >1.0; all the text is correct and consistent in referring to the response as ≥1/0.

Banks et al question our recommendation for screening the men at greatest risk. In fact, our report to the industry* made several recommendations: annual dust and quartz monitoring in the dustiest jobs; improved dust control and suppression, particularly at drilling sites and excavation; static dust meter sampling for airborne dust at selected sites; screening by chest radiography of the more highly exposed employees, every three years in the first instance, until control measures are found to be adequate; follow up study, in due course, to examine the effect of dust control measures on concentrations and on the health of the workforce; and the examination of exposure and health in off site exploration and drilling teams. We thought, and still think, that these recommendations were justified in the light of our findings.

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CORRECTION


The title of table 6 should read “Predicted risks of showing small opacities ≥1/0 as a function...”.

Pulsed electromagnetic fields and cancer

EDITOR.—Savitz, et al have further analysed the reported association between lung cancer and 60 Hz magnetic fields and pulsed electromagnetic fields (PEMF) in electrical utility workers. They found a weak association but raised the possibility that larger associations would be found to promote tumours in animals. The duration of calls is obviously relevant to exposure but the meters used for detecting PEMFs are intended to only detect transient exposures and hence would underestimate exposure to radio frequency radiations. The place of use may also influence exposure. For example communication from a vehicle with an external antenna should cause minimal exposure, but communication from a tower made of metal beams may lead to local field enhancements and increased exposure depending on the power of the radios.

The reported interaction of radio frequency radiations with 3,4-benzopyrene on mouse skin to promote carcinogenesis is relevant to the finding of increased lung cancer in utility workers, some of whom are exposed to occupational carcinogens as well as cigarette smoke. The possibility that radio frequency radiations from radios may act as a cancer promoter could be considered in data analysis of cancer in various sites where differences between industries are found. Adjustment should be made for the types of systems used and the patterns of use by workers. Given the widespread use of radio frequency radiation communication devices in industry a further detailed analysis of the data would be of much interest.

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BOOK REVIEW

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Pulsed electromagnetic fields and cancer.

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*Occup Environ Med* 1998 55: 288
doi: 10.1136/oem.55.4.288

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