

A 20-year follow-up of men aged 55-64 including coal-miners and foundry workers in Staveley, Derbyshire

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ABSTRACT A survey carried out in 1957 by the Medical Research Council's Pneumoconiosis Unit was based on a private census, with brief industrial histories of men aged 55-64 and 25-34. Four groups were established in this way—"non-dusty," "pure coal-mining," "pure foundry," and "other and mixed." In the 55-64 age group all 387 men have been followed up except for one man, about whom we have no information, and another man, for whom we know the date of death but not the certified cause. The mortality from all causes is similar in all four groups, but there is a slight suggestion of a past or present dust problem, or both, in the foundry population. It is suggested that Staveley is, so far, the best area we have found for studying simple pneumoconiosis of coal-miners. If this suggestion is accepted the mortality rates for miners and ex-miners with simple pneumoconiosis seem similar to those of the same age not exposed to industrial dusts, living in the same area, with similar smoking habits.

In the original survey carried out in 1957 by the MRC's Pneumoconiosis Unit¹ a complete private census, together with brief industrial histories, was taken of men aged 25-34 and 55-64 in Staveley, Derbyshire. On the basis of the industrial histories the population was divided into four groups—"non-dusty," "pure coal-mining," "pure foundry," and "other and mixed." Different sampling fractions were then applied to the four groups. The population was followed up nine years later.² The present paper is concerned with the 20-year follow-up of the group aged 55-64.

Material and methods

Of the 387 men seen in 1957, we have failed to trace one man, while for another we know the date of death but have not been able to obtain the certified cause of death. The error introduced is thus small. We are confident that the fate of all the others is known, with the certified causes of the deaths, exactly 20 years (to the day) since they were examined. In addition to the causes of deaths, we have used the x-ray readings for pneumoconiosis by one

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of us (ALC) and the smoking histories from the time of the first survey in 1957.

Results

Table 1 gives the mortality from all causes for the four occupational groups. The differences are small and not statistically significant, but it is of interest that the rate for the coal-mining group is lower than that for the non-dusty group. Table 2 gives the specific causes of death according to the "B list" of the International Classification of Diseases (eighth revision). The non-dusty group appears to have a somewhat higher death rate from ischaemic heart disease but a similar mortality rate for respiratory disease to that of the coal-mining group. Table 3 shows the smoking habits of the four groups. As well

Table 1 *Staveley men aged 55-64: mortality rates from all causes (strict 20 years)*

Group	No	Dead	%
Non-dusty*	80	57	71.3
Pure coal-mining	149	98	65.8
Pure foundry	65	46	70.8
Other and mixed	92	66	71.7
All	386	267	69.2

*One man untraced has been excluded.

Table 2 *Staveley men aged 55-64: specific mortality rates (strict 20 years)*

Group	No	B19 Malignant neoplasm		B28 Ischaemic heart disease		B30 Cerebro- vascular		B26, 27, 29 Other circulatory		B31, 32, 33 Respiratory disease		Other		Cause un- known	All deaths	
		Dead	%	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%		Dead	%
Non-dusty	80	15	18.8	17	21.3	5	6.3	4	5.0	10	12.5	5	6.3	1	57	71.3
Pure mining	149	22	14.8	24	16.1	10	6.7	10	6.7	18	12.1	14	9.4	-	98	65.8
Pure foundry	65	11	16.9	10	15.4	5	7.7	4	6.2	11	16.9	5	7.7	-	46	70.8
Other and mixed	92	16	17.4	16	17.4	7	7.6	4	4.3	12	13.0	11	12.0	-	66	71.7
All	386	64	16.6	67	17.4	27	7.0	22	5.7	51	13.2	35	9.1	1	267	69.2

Table 3 *Staveley men aged 55-64: smoking habits and mortality*

Smoking habit	Occupation groups														
	Non-dusty			Pure mining			Pure foundry			Other and mixed			All four		
	No	%	Dead	No	%	Dead	No	%	Dead	No	%	Dead	No	Dead	%
Never smoked and ex-smokers	24	30.0	9	36	24.2	18	13	20.0	5	18	19.6	12	91	44	48.4
Pipe only	13	16.3	11	19	12.8	13	10	15.4	8	21	22.8	16	63	48	76.2
Cigarettes															
1-14 a day	19	23.8	19	58	38.9	38	19	29.2	13	28	30.4	19	124	89	71.8
≥15 a day	24	30.0	18	36	24.2	29	23	35.4	20	25	27.2	19	108	86	79.6
All	80	100.1	57	149	100.1	98	65	100.0	46	92	100.0	66	386	267	69.2

as underlining the increased mortality associated with smoking, it makes the low mortality of the coal-mining group, in comparison with that of the non-dusty group, more striking as the former has a slightly lower percentage of non-smokers and ex-smokers.

In the report on the first survey¹ attention was drawn to the high prevalence of respiratory symptoms and low mean indirect maximum breathing capacity (IMBC) of three subgroups in the other and mixed group—chemical workers, coke-oven workers, and furnacemen. These were not pure groups, the classification being based on “predominant” occupation. Table 4 shows the mortality rates from all causes for the three subgroups. Only the mortality of the coke-oven workers arouses suspicion, but the numbers are too small to enable any valid conclusion to be drawn.

Table 5 compares the Staveley non-dusty and pure mining groups with the corresponding groups in Leigh,³ and the Rhondda Fach.⁴ The Staveley

Table 4 *Mortality rates for all causes for three industrial subgroups of the other and mixed group*

Subgroup	No	Deaths	%
Chemical workers	29	21	72.4
Coke oven workers	14	11	78.6
Furnacemen	18	12	66.7

results are similar to those in Leigh but very different from those in the Rhondda Fach. The rate for the Staveley mining group is similar to that for the non-dusty in the Rhondda, whose standardised mortality rate was 98.7.⁴ Interestingly the ranking order of the mortality rates for categories 0, 1, 2, and 3 is the same as the prevalence of progressive massive fibrosis (PMF) in the three communities (23.1, 4.7, 0.0).

Table 6 shows the breakdown of the pure mining and pure foundry groups by x-ray category of pneumoconiosis. Both show a higher mortality for simple pneumoconiosis. The number of cases in the foundry group is small and the difference is not statistically significant, but it does suggest that there may have been or possibly still is a dust problem in the industry. The difference in the mining group is also not statistically significant, but it is of interest to examine the differences in greater detail (tables 7 and 8), which strongly suggest that the difference is due to higher cancer and ischaemic heart disease mortality rates, perhaps due to the higher percentage of cigarette-smoking miners and ex-miners with categories 1, 2, and 3 compared with those with category 0.

Discussion

Apart from a slight suspicion about the foundry industry, the fact that the mortality rates of all those

Table 5 20-year follow-up studies of men aged 55-64 in three mining communities

Group	Staveley (1957-77)			Leigh (1954-74)			Rhondda Fach (1950-70)		
	No	Dead	%	No	Dead	%	No	Dead	%
Non-dusty Pure miners and ex-miners Categories 0, 1, 2, 3	80	57	71.3	49	33	67.3	147	98	66.7
	149	98	65.8	81	55	67.9	879	667	75.9

Table 6 Mortality rates in pure coal-mining and pure foundry groups by category of pneumoconiosis

Category of pneumoconiosis	Pure coal-mining			Pure foundry		
	No	Dead	%	No	Dead	%
0	96	61	63.5	50	33	66.0
1	27	21	69.8	11	9	85.7
2	22	13		2	2	
3	4	3		1	1	
ABC	0	—		1	1	100.0
All	149	98	65.8	65	46	70.8

Table 7 Staveley pure coal-mining group aged 55-64: specific causes of death by category of pneumoconiosis

Category of pneumoconiosis	No	B19 Malignant neoplasm		B28 Ischaemic heart disease		B30 Cerebro- vascular		B26, 27, 29 Other circulatory		O10, 515 Pneumo- coniosis		B31, 32, 33 Respiratory disease		Other causes	
		Dead	%	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%
0	96	11	11.5	14	14.6	7	7.3	7	7.3	—	—	13	13.5	9	9.4
1, 2, 3	53	11	20.8	10	18.9	3	5.7	3	5.7	—	—	5	9.4	5	9.4
All	149	22	14.8	24	16.1	10	6.7	10	6.7	—	—	18	12.1	14	9.4

Table 8 Staveley pure coal-mining group aged 55-64: smoking habits and mortality

Smoking habit	Category 0				Categories 1, 2, 3			
	No	%	Dead	%	No	%	Dead	%
Never smoked	15	15.6	7	46.7	4	7.5	2	50.0
Ex-smoker	11	11.5	5	45.5	6	11.3	4	66.7
Pipe only	11	11.5	7	63.6	8	15.1	6	75.0
Cigarettes								
1-14 a day	39	40.6	24	61.5	19	35.8	14	73.7
≥15 a day	20	20.8	18	90.0	16	30.2	11	68.8
All	96	100.0	61	63.5	53	99.9	37	69.8

exposed to possibly dangerous dusts in industry in this area are similar to the rate for the non-dusty group, is reassuring. The general result must be considered satisfactory.

The chief interest lies in the light the results throw on the effect of exposure to coal-dust in general and the long-term effect of simple pneumoconiosis of coal-miners in particular.

Research into disability associated with pneumoconiosis categories 0, 1, 2, and 3 has suffered a great deal from a lack of appreciation of the importance of population selection, although the MRC called attention to it as early as 1956⁵ and has since

studied random samples of miners and ex-miners to reduce the effect of selection. The Rhondda Fach population was excellent for the study of PMF but unsuitable for the study of simple pneumoconiosis as the attacks of PMF were always selecting men out of that population in an unknown way. There was also the unsolved problem of selective migration.

Other problems may arise if miners and ex-miners from different areas are used as one population for a study, owing to the different values for pulmonary function in different areas for the same age/category groups—for instance, the Rhondda Fach and Staveley.⁶

Clearly if simple pneumoconiosis is to be studied in a situation as free as possible from selection it should be in one area with little or no PMF and little migration. Staveley meets both criteria. There was no PMF in our "mining" sample, and there is evidence of a relatively low migration rate.⁶ Then when we look at the 0, 1, 2, and 3 group in Staveley we find an overall mortality rate lower than the non-dusty group and a probable SMR of about 100, an IMBC of 87 compared with 90 for the non-dusty group,¹ and respiratory death rates are practically identical in the two groups. It is true that there was a slightly higher prevalence of cough, sputum, and breathlessness in the 0, 1, 2, and 3 group,¹ but this can be reasonably explained by the higher prevalence of smoking (table 3).

Turning now to the differences between category 0 and categories 1, 2, and 3, the mortality rates of the latter are a little, but not significantly, higher, which is perhaps explained by the higher prevalence of cigarette smokers. Those with simple pneumoconiosis had similar IMBC's (87) to those with category 0 (also 87)¹; the somewhat slightly higher prevalence of respiratory symptoms¹ are reasonably explained by the higher prevalence of smokers (table 8).

We think that this is the true picture of simple pneumoconiosis and in it we find little support for the existence of chronic bronchitis and emphysema induced by coal-dust, however defined.

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