A 20-year follow-up of a population sample (aged 25-34) including coal-miners and foundry workers in Staveley, Derbyshire

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ABSTRACT A 20-year follow-up of a population sample of men aged 25-34 has been completed in Staveley, Derbyshire. The sample was based on a private census, with brief industrial histories, that enabled four groups to be established—"non-dusty," "pure coal-mining," "pure foundry," and "other and mixed." The similarity of the mortality rates of the non-dusty, coal-mining, and foundry groups is satisfactory, but there is, however, a surprisingly high mortality rate in the other and mixed group. We were unable to explain this on the basis of their industrial exposure, and only to a very limited extent by their smoking habits. We suggest that there is a small group of uncooperative men, overweight for their height and heavy smokers, who self-select themselves into jobs that are classified in a study such as this as other and mixed.

The original survey was carried out by the MRC's Pneumoconiosis Unit.¹ A complete private census, together with brief industrial histories, was taken of men aged 25-34 and 55-64 living in Staveley, Derbyshire. This paper is concerned with the younger age-group.

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 applied to the four groups. The population was followed up nine years later.²

Material and methods

We are confident that the fate of all the 369 men examined in 1957 is known, with the certified causes of death, exactly 20 years (to the day) since they were examined. In addition the heights and weights, the industrial histories taken in 1957 and also at the time of the follow-up in 1966, and the smoking histories taken in 1957 were used in this analysis.

Results

Table 1 shows the mortality from all causes in the

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Table 1 *Staveley men aged 25-34: mortality rates at exactly 20 years from initial examination*

Occupation group	No	No dead	%
Non-dusty	114	4	3.5
Pure coal-mining	94	4	4.3
Pure foundry	91	4	4.4
Other and mixed	70	8	11.4
All	369	20	5.4

four groups. The similarity of the mortality rates of the non-dusty, coal-mining, and foundry groups is satisfactory; however the high mortality rate in the other and mixed group would conventionally be regarded as statistically significant. This caused us some alarm as the other and mixed group had been viewed with suspicion, both at the time of the 1957 survey¹ and at the time of the follow-up survey.²

Table 2 shows the mortalities from specific causes in the four groups according to the "B list" of the International Classification of Diseases (eighth revision). Because the increase in mortality is spread among several specific causes, the probability of the excess mortality being due to one industrial cause was rendered unlikely, but we thought we should look at the industrial histories more closely before abandoning it.

Table 3 summarises the predominant occupations and causes of death of the eight people who died in this group. This did not give us any clear-cut lead. We next tried the alternative approach of sub-

Table 2 *Staveley men aged 25-34: specific causes of death according to the "B list" of the International Classification of Diseases (eighth revision)*

Occupation group	No	B19 Malignant neoplasm		B28 Ischaemic heart disease		B30 Cerebrovascular diseases		B31, 32, 33 Respiratory disease		Other causes	
		Dead	%	Dead	%	Dead	%	Dead	%	Dead	%
Non-dusty	114	3	2.6	1	0.9						
Pure coal-mining	94	1	1.1	2	2.1	1	1.1				
Pure foundry	91	1	1.1	1	1.1			1	1.1	1	1.1
Other and mixed	70	2	2.9	3	4.3			2	2.9	1	1.4
All	369	7	1.9	7	1.9	1	0.3	3	0.8	2	0.5

Table 3 *Staveley "other and mixed" age 25-34: cause of death and main occupation of eight deaths*

Cause of death	Occupation
B19 Cancer of lung	Plumber/chemical worker
B19 Cancer of kidney	Maintenance fitter
B28 Ischaemic heart disease	Welder
B28 " " "	Excavator driver (slag)
B28 " " "	Railwayman/furnaceman
B32 Respiratory disease	Overhead crane driver/slag screenhand
B33 " "	Slag screenhand/iron moulder
B4 Acute colitis	Coke oven worker

dividing the group by "predominant" occupation (an exercise that was neither easy nor very reproducible) (table 4). Here again there was no lead. We therefore looked at other characteristics of the four groups that might influence mortality. The obvious choice was smoking habits (table 5). The other and mixed are heavy smokers but their habits are comparable with those of the pure miners, so these cannot be held responsible for all their increased mortality.

Becoming suspicious that selection might play some part in this curious result, we reconstituted the complete cohort (table 6), and compared it with the same age-group in the 20-year follow-up study of the Rhondda Fach,³ which enabled us to compare the mortality rates with those of England and Wales as the standardised mortality ratio for Rhondda Fach non-miners aged 25-74 was 98.7.

Clearly the Staveley cohort (25-34) has a slightly lower mortality, from all causes, than the non-

Table 4 *Staveley "other and mixed" age 25-34*

Subgroup	No	Dead	%
Chemicals and coke ovens	14	2	14.3
Mining/foundry/chemicals mixed	21	1	4.8
Fitters/electricians, etc	16	1	6.3
Other dust exposure	19	4*	21.1
All	70	8	11.4

*Three of these considered to have "low" dust exposure.

miners in the Rhondda Fach.³ This suggests that this Staveley cohort as a whole is a reasonably healthy one, though it does not rule out the possibility that one small subgroup might have a high standardised mortality ratio.

At this stage we naturally examined the hypothesis that there was some curious correlation between the characteristic of staying in one job and a low mortality rate. To test this hypothesis we divided the other and mixed into those who had changed their job frequently, and into those who were less occupationally mobile. We did the division independently and produced similar results (table 7), which gave no support to our hypothesis.

Rather in desperation, we looked at other characteristics of this odd group. Table 8 gives the results of an analysis of the four groups by distribu-

tion and mortality by Quetelet's Index $\left(\frac{wt}{ht}^2\right)$

(which we have found of prognostic value in some unpublished 20-year follow-up studies in higher age

Table 5 *Staveley men aged 25-34: smoking habits and mortality*

Smoking habit	Non-dusty		Pure coal-mining		Pure foundry		Other and mixed		All Staveley		
	No	%	No	%	No	%	No	%	No	Dead	%
Never smoked and ex-smokers	33	28.9	16	17.0	27	29.7	14	20.0	90	3	3.3
Pipe only	8	7.0	2	2.1	3	3.3	1	1.4	14	1	7.1
Cigarettes											
1-14 a day	32	28.1	38	40.4	29	31.9	21	30.0	120	4	3.3
≥14 a day	41	36.0	38	40.4	32	35.2	34	48.6	145	12	8.3
All	114	100.0	94	99.9	91	100.1	70	100.0	369	20	5.4

Table 6 *Staveley men aged 25-34 compared with Rhondda Fach non-miners of the same age*

Area/group	No	Dead	%
Rhondda Fach non-miners	737	48	6.5
Staveley "dusty"*	636	41.8	6.6
All Staveley*	1040	56.0	5.4

*For comparison with the Rhondda Fach group the original population is reconstructed according to the original sampling fractions.

Table 7 *Staveley other and mixed group age 25-34: mortality according to occupation subgroups*

Subgroup	No	Dead	%
"Pure" other	12	2	16.7
Mixed	58	6	10.3
Both	70	8	11.4
Mixed only— changes of occupation			
Infrequent	20	2	10.0
Frequent	38	4	10.5
Both	58	6	10.3

groups). The distribution of body type in the other and mixed group is similar to that of the non-dusty group, but the case-fatality rate is much higher in the upper range in the other and mixed group.

We also looked at social class (table 9). We found it rather unsatisfactory for this particular study as according to the *Classification of Occupations 1970*⁴ all miners working underground must be classified as class III, and those on the surface as IV, except artisans. This makes the comparison between coal-miners and other workers rather biased. Table 9 shows that there is, as expected, an overall relation-

ship between mortality and social class; and that the distribution of social class in foundry workers, and in the other and mixed group on the one hand and the non-dusty on the other, is very different, but as there is no difference in the distribution of social class between the foundry workers and the other and mixed group it is unlikely the social class can explain the differences in mortality.

We finally looked at the order of being examined. This is a difficult type of investigation, as the order is inevitably related to the order in which they were visited. There were further snags. Thus there was some correlation between the areas in which people lived and their occupation, and there were also two decisions taken as regards priority in visiting. We agreed to give priority to the older age group and to delay visiting the miners for the first two days as they lived slightly further away. The visiting was done by three members of the MRC staff (one of whom was ALC). There was certainly no bias against visiting the other and mixed group which we believe was scattered throughout the community. Serial numbers were allocated in the order they came to the centre. Table 10 gives the percentage of each occupational group in the four sets of 200 numbers taken consecutively. Those in the last 200 were visited very frequently. Clearly the other and mixed group were, to say the least, uncooperative. An even odder result is shown in table 11, which relates the order of being examined to mortality. None of the deaths in the other and mixed group occurred within two years of the survey.

Table 8 *Quetelet index (excluding one pure foundry who died in first two years and one pure foundry where height and weight were not recorded)*

Quetelet index	Non-dusty				Pure coal-mining				Pure foundry				Other and mixed			
	No	%	Dead	%	No	%	Dead	%	No	%	Dead	%	No	%	Dead	%
Below 21.5	35	30.7	0	—	25	26.6	1	4.0	40	44.9	2	5.0	23	32.9	1	4.3
21.5-24.4	41	36.0	1	2.4	44	46.8	2	4.5	33	37.1	1	3.0	24	34.3	0	—
≥24.5	38	33.3	3	7.9	25	26.6	1	4.0	16	18.0	0	—	23	32.9	7	30.4
All	114	100.0	4	3.5	94	100.0	4	4.3	89	100.0	3	3.4	70	100.1	8	11.4

Table 9 *Staveley men aged 25-34: social class and mortality*

Social class	Occupation groups								All		
	Non-dusty		Pure coal-mining		Pure foundry		Other and mixed		No	Dead	%
	No	%	No	%	No	%	No	%			
I	3	28.1	2	6.4	—	2.2	—	1.4	5	—	—
II	9		3		1		—		13	—	—
IIIN	20	58.8	1	79.8	1	65.9	1	64.3	23	1	4.3
IIIM	67		75		60		45		247	11	4.5
IV	12	13.2	12	13.8	21	31.9	16	34.3	61	6	9.8
V	3		1		8		8		20	2	10.0
All	114	100.1	94	100.0	91	100.0	70	100.0	369	20	5.4

Table 10 *Staveley men aged 25-34: order of coming to be examined*

Identification numbers given at time of coming up	Occupation groups							
	Non-dusty		Pure coal-mining		Pure foundry		Other and mixed	
	No	%	No	%	No	%	No	%
2800 and 2900	28	24.6	1	1.1	23	25.3	3	4.3
3000 and 3100	24	21.1	30	31.9	25	27.5	10	14.3
3200 and 3300	29	25.4	40	42.6	23	25.3	26	37.1
3400 and 3500	33	28.9	23	24.5	20	22.0	31	44.3
All	114	100.0	94	100.0	91	100.1	70	100.0

Table 11 *Staveley men aged 25-34: order of being examined and mortality*

Identification numbers given at time of coming up	Non-dusty Pure coal-mining Pure foundry			Other and mixed		
	No	Dead	%	No	Dead	%
2800 and 2900	52	3	5.8	3	0	—
3000 and 3100	79	1	1.3	10	0	—
3200 and 3300	92	3	3.3	26	2	7.7
3400 and 3500	76	5	6.6	31	6	19.4
All	299	12	4.0	70	8	11.4

Mortality in this group, but not in the others, appears to be associated with body-type and "uncooperativeness," and possibly smoking habit.

We examined the possibility of "potentiation" between the various pairs of these three factors by means of "2 × 2" tables. We could find no such evidence, but owing to the small numbers of deaths we were unable to exclude such a possibility.

We can only conclude that there is a small group of overweight, uncooperative men who smoke more than average, who have a raised mortality, and who select themselves by their uncooperativeness into the other and mixed group. They would appear to be a menace to themselves. They are certainly a menace to epidemiologists.

References

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