

Mortality of men in the Rhondda Fach 1950-80

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ABSTRACT In a 30 year follow up study of 8526 men aged 20 and over in the Rhondda Fach 99.9% of the population was traced. Generally, the results are similar to those found in a 20 year follow up of the same subjects. Miners and ex-miners had an excess mortality compared with non-miners, but within the former only those who had had categories B and C pneumoconiosis showed a raised mortality. Category A pneumoconiosis was not associated with any excess compared with other miners and ex-miners. Two further aspects of the data relating to gastric cancer and progressive massive fibrosis will be examined in later reports.

The population of the Rhondda Fach has been described previously.¹⁻³ For this publication the population has been slightly improved from that previously described by the elimination of a few duplicates, the retracing of men previously considered lost to follow up, and the continued examination of dates of birth on death certificates, compared with those stated when first seen. The population was not "flagged" at the National Health Service Central Registers, and the successful follow up was mainly due to "foot slogging." The follow up was at exactly 30 years from the date each individual was examined. The Registrar General's annual statistical reviews of England and Wales were used to calculate the expected number of deaths. The causes of deaths were grouped for coding as shown in the appendix. Much of the analysis was carried out using the program PYCL, which computed expected values from the number of person-years at risk and the external rates.⁴ Further analysis of trends was carried out using methods described by Breslow.⁵

Results

SURVIVAL RATES

Table 1 gives the details of the male population aged 20 or more available for analysis; the number not traced is satisfactorily small. Table 2 gives the population of miners and ex-miners by age and radiological categories of coalworkers' pneumoconiosis in 1950,

table 3 the numbers of deaths for all men by age, occupation, and radiological status, and table 4 the percentage surviving 30 years for the same groups. Table 5 gives the standardised mortality ratios (SMRs) for the same groups. For these we have used the rate per 1000 person-years, which is a slight improvement on the previous paper.³ As expected in such a large breakdown there are some maverick values in table 4, which have been fully discussed.³

In table 5 one might have expected a gradual rise in SMRs from category 0 to category 3 as simple pneumoconiosis progressed due to dust exposure in working miners and the men became at increasing risk of developing progressive massive fibrosis, which progresses to categories B and C with their known high mortality. Instead, we find the SMRs for those with categories 0, 1, and 2 remaining unchanged. Those with category 3 SMR have risen a little, but the one surprise is the continuing relatively low SMR of those with "A" shadows, which is similar to those for categories 0, 1, and 2. One would have expected all the As to have become Bs or Cs in 30 years, leading to a high SMR. This anomaly will be discussed in detail in a later paper.

SPECIFIC MORTALITY

The SMRs by radiological status for the more common conditions are given in table 6. The picture is similar to that found in the 20 year follow up—that is, high SMRs for bronchitis (see below) and low for carcinoma of the trachea, bronchus, and lung. The SMR for carcinoma of the large intestine is on the low side for non-miners but there is insufficient evidence to suggest that exposure to coal dust increases mortality

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Table 1 Men of Rhondda Fach by age and occupation in 1950-1 and number available for analysis

Age groups	Non-miners				Miners and ex-miners			
	Defined population 1950-1	Not x rayed 1950-1	Not traced at 30 y	X rayed and available for analysis	Defined population 1950-1	Not x rayed 1950-1	Not traced at 30 y	X rayed and available for analysis
20-24	492	13	0	479	325	1	1	323
25-34	736	33	4	699	1148	8	2	1138
35-44	447	28	1	418	1346	14	0	1332
45-54	222	23	1	198	1338	13	0	1325
55-64	148	16	1	131	1170	32	0	1138
65-74	62	11	0	51	766	58	1	707
≥75	32	8	0	24	294	75	0	219
Total	2139	132	7	2000	6387	201	4	6182

Table 2 Miners and ex-miners by age and radiological category in 1950-1

Age	Radiological category							Total
	0	1	2	3	A	BC		
20-24	277	25	17	1	2	1	323	
25-34	717	147	119	82	47	26	1138	
35-44	663	157	174	120	89	129	1332	
45-54	691	187	128	70	98	151	1325	
55-64	561	165	105	46	78	183	1138	
65-74	325	99	70	25	59	129	707	
≥75	119	29	13	4	13	41	219	
Total	3353	809	626	348	386	660	6182	

Table 3 Numbers of deaths of all men in 30 years by age, occupation and radiological category in 1950-1

Age	Non-miners			Miners and ex-miners								
	Total traced	Not x rayed 1950-1	Seen	0	1	2	3	A	BC	All seen	Not x rayed 1950-1	Total traced
20-24	40	2	38	29	5	3	0	0	0	37	1	38
25-34	131	10	121	142	27	22	22	11	14	238	1	239
35-44	183	17	166	313	79	96	68	55	102	713	7	720
45-54	156	16	140	542	146	105	51	76	144	1064	9	1073
55-64	138	16	122	547	158	103	46	77	178	1109	31	1140
65-74	61	11	50	324	97	70	25	59	129	704	58	762
≥75	32	8	24	119	29	13	4	13	41	219	75	294
Total	741	80	661	2016	541	412	216	291	608	4084	182	4266

For comparison with the population of miners and ex-miners (x rayed in 1950-1) we could use the whole non-mining population or those x rayed in 1950-1. We decided the latter was more logical. In any case it makes little difference.

Table 4 Percentage of men by age and radiological category in 1950-1 surviving 30 years

Age	Non-miners			Miners and ex-miners								
	Total traced	Not x rayed	Seen	0	1	2	3	A	BC	Seen	Not x rayed	Total traced
20-24	91.9	84.6	92.1	89.5	80.0	82.4	100.0	100.0	100.0	88.5	0.0	88.3
25-34	82.1	69.7	82.7	80.2	81.6	81.5	73.2	76.6	46.2	79.1	87.5	79.1
35-44	59.0	39.3	60.3	52.8	49.7	44.8	43.3	38.2	20.9	46.5	50.0	46.5
45-54	29.4	30.4	29.3	21.6	21.9	18.0	27.1	22.5	4.6	19.7	30.8	19.8
55-64	6.1	0.0	6.9	2.5	4.2	1.9	0.0	1.3	2.7	2.6	2.1	2.6
65-74	1.6	0.0	2.0	0.3	2.0	0.0	0.0	0.0	0.0	0.4	0.0	0.4
≥75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	65.2	39.4	67.0	39.9	33.1	34.2	37.9	24.6	7.9	33.9	9.5	33.2

Table 5 Thirty year mortality by occupation and radiological category in 1950-1 for age group 20-74

Occupation/category	Observed deaths	SMR	95% Confidence limits for SMR
Non-miners excluding those not x rayed 1950-1	637	99.0	91.4, 106.8
<i>Miners and ex-miners</i>			
Cat 0	1897	121.2	115.8, 126.7
Cat 1	512	117.8	107.8, 128.2
Cat 2	399	121.2	109.6, 133.7
Cat 3	212	129.6	112.8, 148.3
Cat A	278	124.3	110.1, 139.8
Cat B, C	567	198.1	182.1, 214.8

Table 6 Observed deaths and SMRs for some specific causes of death for age group 20-74

	<i>Bronchitis</i>		<i>Other respiratory</i>		<i>Ischaemic heart disease</i>		<i>Cerebrovascular disease</i>		<i>Other circulatory</i>		<i>Violence etc</i>	
	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR
Non-miners	32	79	37	63	223	113	68	111	61	106	21	71
Cat 0	248	219	147	100	554	119	201	115	185	121	63	125
Cat 1, 2, 3	159	233	84	94	305	111	117	112	114	125	43	155
Cat A	40	239	22	103	55	83	25	95	23	102	4	66
Cat B, C	54	24	34	134	73	88	16	46	34	117	3	39
<i>Malignant neoplasms</i>												
	<i>Trachea/bronchus/lung</i>		<i>Stomach</i>		<i>Large intestine</i>		<i>Rectum</i>		<i>Pancreas</i>		<i>Other</i>	
	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR
Non-miners	43	70	24	131	3	31	4	53	6	93	45	119
Cat 0	100	77	69	152	20	85	13	70	16	112	100	117
Cat 1, 2, 3	60	77	33	123	16	116	10	91	4	47	47	93
Cat A	12	69	14	217	3	90	2	74	2	102	13	109
Cat B, C	19	91	13	151	1	23	4	113	5	207	16	107

from this cause. For carcinoma of the pancreas, not considered in the previous papers, the data do not suggest that its incidence is increased by exposure to coal dust. The SMRs for gastric cancer appear bizarre, but will be discussed in detail in a subsequent paper.

The increased number of deaths in the 30 year follow up gives us the opportunity of investigating the problem of why the SMRs of categories 0, 1, 2, and 3 are so similar, although the SMR for pneumoconiosis rises sharply with increasing category.

Although numbers of deaths from pneumoconiosis are low relative to other causes of death, it is possible that the SMR from a single cause or group of causes may fall in compensation. This possibility is explored in table 7, where it should be noted that the SMRs for

pneumoconiosis are almost certainly too low.⁶ There are no statistically significant trends with increasing category of pneumoconiosis, except that of pneumoconiosis itself. Deaths from "other malignant neoplasms" show a consistent but not significant downward trend with increasing category.

Discussion

The results given in this paper may be compared with the equivalent results for the 20 year follow up.³ The remarkable result of the previous paper was the high mortality of miners and ex-miners when compared with non-miners. Subsequent research has shown that this excess is peculiar to the Rhondda Fach,⁶ and was not found in Leigh in Lancashire or Staveley in

Table 7 Observed deaths and SMRs for some specific causes of death by simple pneumoconiosis for age group 20-74

Category of pneumoconiosis	<i>Pneumoconiosis</i>		<i>Bronchitis</i>		<i>Other respiratory</i>		<i>Ischaemic heart disease</i>		<i>Cerebrovascular disease</i>		<i>Other circulatory</i>		<i>Violence etc</i>		<i>Malignant neoplasms</i>		<i>Other</i>		
	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR	No	SMR	
14	314	248	219	147	121	544	119	201	115	184	121	63	126	100	77	69	153	149	95
5	398	75	232	38	110	143	112	62	124	50	116	17	135	22	63	15	120	39	86
20	2152	60	269	32	123	96	99	40	107	43	132	17	173	25	91	13	137	26	75
19	4009	24	203	14	114	66	135	15	87	21	136	9	170	13	86	5	103	12	68
for trend*	62.7	0.14	0.05	0.22	0.71	0.37	1.59	0.34	0.94	2.36									

* significance level is 3-84.

Derbyshire. This 30 year follow up confirms this excess mortality of miners and ex-miners compared with the non-miners. The contrast with the non-miners emerges only after the age of 35, and so may relate to conditions in the Rhondda before the Second World War.

The relatively high survival rate of miners and ex-miners aged 35–44 without pneumoconiosis which was apparent after 20 years has greatly diminished after 30 years, and so was possibly due to random variations. The almost complete mortality of those aged 55 and over has obscured differences in survival among radiological categories in these age groups.

The previous paper used a weighting method to compute the SMRs whereas the present paper uses a method that takes into account the person-years in each group, which is a slight improvement.

Since the SMRs for category 0 and categories 1–3 in table 6 are so similar it is reasonable to ask whether those in categories 1–3 are protected in some way from deaths other than pneumoconiosis. The deaths from pneumoconiosis, however, are low relative to other causes, and random variation appears to account for any apparent trends in the other causes of death.

In general there is little change from the results of the 20 year follow up except for the two points about gastric cancer and the aetiology of PMF which will be discussed in subsequent papers. The value of the 30 year follow up is to re-emphasise the 20 year result, that those with category A pneumoconiosis in the Rhondda Fach did not suffer an increased mortality compared with other miners or ex-miners with or without pneumoconiosis. Nevertheless, miners and ex-miners had an excess mortality compared with non-miners.

We would however like to use this opportunity to make two general points.

(1) This survey achieved 99.9% follow up. It was done without flagging at NHSCR. (One of us (ALC) did not think he would live long enough.) The survey was not costly. The result was also not a flash in the pan. Two of us (ALC and FM) achieved similar

figures in our seven 20 year follow up studies of random samples of men and women in England, Scotland, and Wales. Other epidemiologists using captive populations and flagging do not seem to bother to achieve similar figures. Flagging seems to have replaced foot slogging whereas it should be used to reduce it. We think that this is regrettable.

(2) The value of all follow up studies in the United Kingdom (and almost certainly in other countries) is much reduced by the low standard of death certification. The reckless use by the pathologists of the phrase “bronchitis and pneumoconiosis” is a crying example in this paper.⁷ We would like to make a plea for the better education of medical students, for consultants to be made responsible for death certificates signed by their juniors, and for pathologists to know the coding rules for death certificates, even though the deaths are eventually certified by coroners.

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Appendix

GROUPING OF CAUSES OF DEATH USED FOR SMRS

<i>Cause of death</i>	<i>ICD/6 to 1957 ICD/7 1958–67</i>	<i>ICD/8 1968–78</i>	<i>ICD/9 1979 and later</i>
Bronchitis	501, 502	490, 491	490, 491, 496
Pneumoconiosis	523, 001	515, 010	500, 502, 505
Other respiratory	241, 470–527 excluding 501, 502, 523	460–519 excluding 490, 491, 515	460–519 excluding 490, 491, 496 500, 502, 505
Ischaemic heart disease	420, 422	410–414	410–414
Cerebrovascular disease	330–334	430–438	430–438
Other circulatory	400–468 excluding 420–422	390–458 excluding 410–414 430–438	390–459 excluding 410–414 430–438
Violence	E800–999	E800–999	E800–999
Malignant neoplasm:			
Trachea/bronchus/lung	162, 163	162	162
Stomach	151	151	151
Large intestine	153	153	153
Rectum	154	154	154
Pancreas	157	157	157
Other	140–205 excluding 151, 153, 154 157, 162, 163	140–209 excluding 151, 153, 154 157, 162	140–208 excluding 151, 153, 154 157, 162