

1704 A FOLL

# A FOLLOW-UP STUDY OF WORKERS FROM AN ASBESTOS FACTORY

BY

P. C. ELWOOD and A. L. COCHRANE

with the assistance of

I. T. BENJAMIN and D. SEYS-PROSSER

From the Epidemiological Research Unit (South Wales)

(RECEIVED FOR PUBLICATION JUNE 15, 1964)

*Cancer  
causation*

Associations between exposure to asbestos and carcinoma of the lung, diffuse mesothelioma of the pleura, and diffuse abdominal tumours have been demonstrated. Only by an epidemiological approach can the total risks of exposure to asbestos be estimated, and such a study is reported here. This suggests that white asbestos (chrysotile) may not be a serious hazard as far as mesothelioma or abdominal tumours are concerned, though there is some evidence of an excess in the number of deaths from carcinoma of the lung and bronchus.

A causative association between asbestosis and carcinoma of the lung has been known to exist for many years (Lynch and Smith, 1935), and it has more recently been shown that lung cancer is a specific industrial hazard of certain workers who have been heavily exposed to asbestos (Doll, 1955). More recently an association between exposure to asbestos and diffuse mesothelioma of the pleura (Wagner, Sleggs, and Marchand, 1960) and diffuse abdominal tumours (Enticnap and Smither, 1964) has been postulated. However, few data relating to the prevalence of mesothelioma, or indeed of carcinoma of the lung, in defined groups of workers who had been exposed to asbestos have been published, and data based on necropsies may, because of the selection of workers so examined and a lack of knowledge of the total population from which they are drawn, give a false impression of their prevalence.

Selikoff, Churge, and Hammond (1963) followed up 632 asbestos insulation workers with a history of 20 years or more since their first exposure to asbestos dust. During the 20 years immediately before the study, 255 had died, 45 (17.6%) due to malignant tumours of the lung or pleura. Three mesotheliomata of the pleura (1.2% of all deaths) and one of the peritoncum were found, and they also noted carcinoma of the gastro-intestinal tract in 29 (11.4%) of all deaths. The numbers of deaths from all these causes were considerably in excess of those expected

on the basis of the mortality experience of all white males in the United States during the same period.

A similar study was reported by Mancuso and Coulter (1963), who in 1960 followed up 1,266 men and 229 women who had worked in an asbestos works in Ohio in 1938 or 1939. They found a small excess in the number of deaths in each sex from all causes, which was more marked in deaths due to neoplasms and asbestosis compared with the numbers expected on the basis of death rates during the same period for the area in which the asbestos works was situated.

The following is a report of a follow-up study of all persons who, since 1936, had worked in an asbestos works near Cardiff for a period of six months or longer. The management and type of work done in this factory had changed in 1935, and complete records were available only for the subsequent period, but before this change some asbestos had been used. Asbestos sheeting for the building industry and pipe lagging are the main products of the factory, and since 1935 only chrysotile from southern Africa and from Canada have been used, though it is possible that some crocidolite may have been used during the period 1932-35 in the manufacture of high-pressure pipes.

No mention of the reasons for this study was made to any of the persons or agencies contacted, other than the management of the factory concerned.

Although this made much more difficult, it in this way.

In all, 1,165 men the factory for six months or more between 1936 to 1962 inclusive and 237 women (88 men and 11 women) were traced respectively (71% and 57% of those ascertained for 127 men and 23 women).

No death due to asbestos was identified, but one from mesothelioma of the pleura in 1906 and had worked in the asbestos works had entered the asbestos industry. He had then been transferred to another asbestos works where he died from carcinoma of the lung (Table 162 and 163). The results are shown in Table 3.

The length of time after which it may be attributed any death to asbestos is unknown in a largely arbitrary analysis in greater detail. The group studied here was relatively few women. Analysis is confined to Table 4 shows the

\*International Statistical Institute Causes of Death, World II

### DISTRIBUTION OF

Year of Birth
1870-
1880-
1890-
1900-
1910-
1920-
1930-
1940-
Unknown
Totals

Numbers dead during study  
Numbers not traced shown

1964

Although this made the field work of the study much more difficult, it was thought essential to do it in this way.

Results

In all, 1,165 men and 268 women had worked in the factory for six months or more during the period 1936 to 1962 inclusive. Of these, 1,024 men (88%) and 237 women (88%) were traced, and, of these, 133 men and 11 women were found to have died, 13% and 5% of the numbers of men and women traced respectively (Table 1). The cause of death was ascertained for 127 of these (Table 2).

No death due to a diffuse abdominal neoplasm was identified, but one man was found to have died from mesothelioma of the pleura. He was born in 1906 and had worked first in a cement works. He had entered the asbestos industry in 1932 and had worked as a beater attendant for four years. He had then been transferred to the drawing office of the asbestos works where he remained until 1953 when he left the industry. Apart from this man, 11 had died from carcinoma of the lung or bronchus (I.S.C.\* 162 and 163). The relevant details of these are shown in Table 3.

The length of time after first exposure to asbestos after which it may be considered justifiable to attribute any death, wholly or in part, to exposure to asbestos is unknown and must therefore be chosen in a largely arbitrary way. We have decided to analyse in greater detail only those deaths in the group studied here which occurred 15 years or more after first exposure to asbestos. As there were relatively few women exposed to risk, this further analysis is confined to men.

Table 4 shows the distribution of deaths by cause

TABLE 2  
DISTRIBUTION OF DEATHS AT ALL AGES BY SEX AND CAUSE

No.*	Cause of Death	No. of Deaths	
		Males	Females
1, 2	Tuberculosis	8	3
3-9	Other infections	1	—
	All infections	9 (8.3)†	3
10	Neoplasms: stomach lung, bronchus and pleura breast, uterus others	3	—
11		12 (11.1)†	—
12, 13		—	1
14, 15		7	1
	All neoplasms	22 (20.4)†	2
18	Coronary disease	14	2
17, 19-21	Other heart & vascular disease	27	2
	All circulatory disease	41 (39.0)†	4
22-25	Bronchitis, etc. Other causes Ill-defined diseases Accidents: vehicle others	10	—
26-31		6	—
32		3	1
33		9	—
34, 35	8	—	
	All accidents (other than war)	17 (15.7)†	—
	Total for which cause known (excluding war)	108 (100.0)†	10
	Deaths due to war	19	—
	Total for which cause not yet known	4	1
	Grand total	133	11

\*Abridged list of causes of death as used by the R.C.O. for England and Wales.

†Number of male deaths for certain causes shown as a percentage of all deaths for which cause is known (excluding deaths due to war).

in those men workers who had died 15 years or more after they had first been exposed to asbestos, together with, for certain causes, the proportionate mortality figures in this group of workers, and in all men (25-64 years) in south-east Wales during the same period. There is some evidence of an excess in the proportion of deaths due to neoplasms of the lung, bronchus, and pleura, and of deaths due to accidental causes. Deaths due to diseases of the circulatory system also show a slight excess, but there is

\*International Statistical Classification of Diseases, Injuries and Causes of Death; World Health Organization, 1957.

TABLE 1  
DISTRIBUTION OF POPULATION WITHIN CRITERIA OF STUDY BY SEX, AGE, WHETHER OR NOT TRACED, AND WHETHER OR NOT DEAD

Year of Birth	Total Traced		Dead		Not Traced		Grand Totals	
	Male	Female	Male	Female	Male	Female	Male	Female
1870s	10	—	10 (100)*	—	—	—	—	—
1880s	27	3	16 (59)	—	1 (4)	—	11	—
1890s	73	8	29 (40)	—	16 (37)	—	41	3
1900s	161	28	24 (15)	—	7 (9)	—	80	10
1910s	304	73	31 (10)	—	25 (11)	—	186	32
1920s	327	103	21 (6)	—	37 (11)	13 (15)	341	86
1930s	103	17	2 (2)	—	11 (10)	11 (10)	266	114
1940s	10	5	—	—	1 (10)	1 (6)	114	18
Unknown	—	—	—	—	1 (9)	1 (17)	11	6
Totals	1015	237	133 (13)	11 (5)	138 (12)	32 (12)	1153	269

\*Numbers dead shown in brackets as percentages of numbers traced.  
†Numbers not traced shown in brackets as percentages of grand totals.