A mortality study of cement workers

M E McDOWALL

From the Medical Statistics Division, Office of Population Censuses and Surveys, London WC2B 6JP, UK

ABSTRACT Occupational exposure to dust has been linked with excess mortality from stomach cancer. To examine this hypothesis in respect of cement workers the mortality of a group of men, identified as cement workers in 1939, was followed up from 1948 to 1981. An excess of mortality from stomach cancer was found which is not thought to be explained by the social class distribution of the study population. Mortality from respiratory disease was not increased.

Occupational health studies of workers engaged mainly in the manufacture of cement have concentrated on morbidity from occupational dermatitis¹ and on the possible impairment of the respiratory system due to heavy exposure to dust. In reviewing published reports on respiratory effects Bazas concluded that epidemiological reports from around the world were contradictory,² and further evidence has suggested that, whereas exposure to cement dust may cause some respiratory impairment, cigarette smoking is more likely to produce chronic bronchitis or ventilatory changes.³

Recently, however, it has been suggested that exposure to dust may be linked with some excess mortality from stomach cancer.^{4,5} To examine this hypothesis in respect of cement workers, the records of the National Health Service Central Register (NHSCR) and the Office of Population Censuses and Surveys (OPCS) were examined to describe the subsequent mortality of a group of men identified as cement workers in 1939.⁶

Method

Three areas in north Kent, where cement works were in operation and had been so in 1939, were identified, Northfleet, Snodland, and Halling. NHSCR records for these areas were searched for men whose occupational description in 1939 included mention of cement manufacture (excluding those engaged in the production of cement bags). For each cement worker, information concerning job description was extracted together with date of birth and, where relevant, date of death. In the latter cases the death certificate was obtained and cause coded by OPCS staff to the underlying cause of

death according to the 8th revision of the International Classification of Disease (ICD).

The men were classified into four occupational groups on the basis of the recorded designation of the occupation.

- (1) Laboratory staff, clerks, timekeepers, storekeepers, canteen staff, and other staff;
- (2) Maintenance and other skilled/semiskilled craftsmen plus machinery operators and crane and lorry drivers;
- (3) Labourers specified as engaged in packing and loading; and
- (4) Other labourers and inadequately described occupations.

Records extracted from NHSCR included dates of emigration but no details of any temporary absences due to service in the armed forces or short term emigration during and immediately after the second world war. Deaths during these absences are unlikely to have been recorded at NHSCR and thus an analysis from 1939 could have produced an overestimate of person-years of risk. Consequently, the date of entry to the study was taken to be 1 January 1948 and only those cement workers recorded as being alive at that date were included in the study. (1948 was chosen because record keeping arrangements in connection with the start of the National Health Service make it possible to identify those cement workers alive at that date. In addition the bulk of postwar demobilisation was complete then.)

Persons-years at risk were calculated from 1 January 1948 until the end of 1981 or to the date of death or emigration. Expected numbers of deaths for the causes of death analysed were calculated on the basis of the corresponding male mortality rates for England and Wales. (Cancer death rates were derived from *Cancer mortality England and Wales, 1911-1970*, OPCS studies on medical and popula-

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Table 1 *Standardised mortality ratios (SMRs) for major causes of death for cement workers (1948–81)*

<i>Cause of deaths (8th rev: ICD code)</i>	<i>SMR</i>	<i>No of deaths</i>
All neoplasms (140–239)	103	94
Cancer of oesophagus (150)	116	3
Cancer of stomach (151)	175*	22
Cancer of large intestine (153)	89	6
Cancer of rectum (154)	186	10
Cancer of lung (162)	85	28
All circulatory disease (390–458)	94	209
Ischaemic heart disease (410–414)	72*	92
Cerebrovascular disease (430–438)	111	59
All respiratory disease (460–519)	86	60
Bronchitis, emphysema, and asthma (490–493)	78	27
Accidents (800–999)	103	12
Other causes	90	44
All causes	95	419

*SMR significantly different from 100 at 95% confidence level.⁷

tion subjects No 29. HMSO. 1975; for other causes published mortality data from 1948 were converted to ICD (8) codes for this purpose.)

Results

The study population consisted of the 607 men known to have been alive on 1 January 1948 of the 671 originally identified as cement workers in 1939. Of these 607 men, 419 had died by 31 December 1981.

Table 1 shows standardised mortality ratios (SMRs) for all the study population for major causes of death (expected deaths being calculated on the basis of all England and Wales male mortality rates). Overall mortality is slightly lower than expected (SMR 95) and mortality from respiratory disease is also low (SMR 86). The SMR for stomach cancer is significantly raised (175), and the ratio for cancer of

the rectum is also high but not statistically significant.

In table 2 the SMRs are shown for the same causes but for the four occupational groupings employed. Laboratory and office workers would clearly have the lowest exposure to dust of the four groups and despite the small numbers of cases are apparently the healthiest group, showing the lowest SMRs for bronchitis and stomach cancer. So long after the assignment of the occupational descriptions it would be difficult to estimate any sensible variation in dust exposure as between the remaining three occupational groups. Logic suggests, however, that packing and loading cement would produce considerable dust exposure and the SMR for stomach cancer is highest in this group (321), albeit based on only four deaths.

Discussion

The present study has followed up from 1948 to 1981 the mortality of a group of men identified as cement workers in 1939. No information is available on the length of time the men were employed in cement works. Of the 419 men dying between 1948 and 1981, however, 179 (43%) were recorded as cement workers at registration of death and were thus either still employed in the industry at death or had previously retired from it.

The SMRs in this study have been calculated on the basis of the male mortality rates for England and Wales. Equivalent rates by social class are not available from 1948 to 1981 so it is not possible to assess directly how much the mortality pattern shown here is a product of social rather than occupational factors. Table 3, however, shows SMRs by social class

Table 2 *Mortality of cement workers by cause and occupation*

<i>Cause of death</i>	<i>Occupation</i>			
	<i>Laboratory workers clerks, etc</i>	<i>Maintenance workers craftsmen, machinery operators</i>	<i>Labourers specified as packing or loading</i>	<i>Other labourers and inadequately described occupations</i>
	<i>SMR (deaths)</i>	<i>SMR (deaths)</i>	<i>SMR (deaths)</i>	<i>SMR (deaths)</i>
All neoplasms	64 (7)	106 (29)	92 (9)	114 (49)
Oesophagus	— (0)	130 (1)	— (0)	157 (2)
Stomach	70 (1)	211 (8)	321 (4)	148 (9)
Large intestine	135 (1)	100 (2)	— (0)	89 (3)
Rectum	170 (1)	124 (2)	— (0)	259 (7)*
Lung	47 (2)	50 (5)	25 (1)	137 (20)
All circulatory disease	91 (22)	96 (64)	92 (19)	95 (104)
Ischaemic heart disease	70 (10)	70 (27)	90 (11)	70 (40)
Cerebrovascular disease	55 (3)	112 (18)	110 (5)	122 (33)
All respiratory disease	92 (7)	66 (14)	105 (7)	94 (32)
Bronchitis, emphysema, & asthma	52 (2)	75 (8)	60 (2)	89 (15)
Accidents	68 (1)	115 (4)	86 (1)	109 (6)
All causes	81 (41)	95 (126)	97 (40)	97 (212)

*SMR significantly different from 100 at 95% confidence level.⁷

Table 3 SMRs by social class for selected causes of deaths from the Decennial Supplements on Occupational Mortality^{4,8,9}

<i>England and Wales</i>		<i>Men aged 20-64</i>				<i>Deaths in:</i>	
		<i>15-64</i>				<i>(1950)</i>	
		<i>15-64</i>				<i>(1959-63)</i>	
						<i>(1970-2)</i>	
		<i>Social class</i>					
		<i>I</i>	<i>II</i>	<i>IIIN</i>	<i>IIIM</i>	<i>IV</i>	<i>V</i>
Cancer of stomach	1950	57	67		100		132
	1959-63	49	63		101		163
	1970-72	50	66	79		118	147
Cancer of rectum	1950	74	90		109		87
	1959-63	74	89		106		120
	1970-72	84	90	103		114	108
Cancer of lung	1950	80	79		108		116
	1959-63	53	72		107		148
	1970-72	53	68	84		118	143
Bronchitis, emphysema, and asthma	1950	33	53		97		172
	1959-63	28	50		97		194
	1970-72	36	51	82		113	188

for stomach, rectal, and lung cancer, and bronchitis, emphysema, and asthma, derived from the Registrar General's Decennial Supplements on Occupational Mortality for 1951, 1961, and 1970-2, and, with the exception of rectal cancer, clearly the incidence of these cases was related to social class during the study period, the association being most pronounced for bronchitis. The occupation groups in table 2 cover a range of social classes, specifically:

(1) Laboratory workers, clerks, etc, include social classes II to IV but would be predominantly IIIN (skilled non-manual);

(2) Maintenance workers, craftsmen, etc, would be predominantly class IIIM (skilled manual); and

(3) The two labourer groups would be predominantly class V (unskilled) with a few class IV (semi-skilled) occupations.

The overall SMR for stomach cancer in this study appears higher than would be expected on the basis of social class alone judging from the data in table 3. In addition, the SMRs for maintenance workers and craftsmen (211 on 8 deaths) and for packing and loading workers (321 on 4 deaths) are notably higher than their social class related expected levels. Finally, overall mortality from lung cancer and from bronchitis, emphysema, and asthma is low (SMRs of 85 and 78 respectively) and it seems unlikely that social class would be wholly responsible for the excess mortality in stomach cancer, while allowing deficits in two other causes with significant social class gradients. The excess risk of stomach cancer hypothesised for this group of workers on the grounds of high exposure to dust appears, therefore, to have been confirmed by this study, although part of the overall excess mortality noted in table 1 may be explained by the social class distribution of the study population.

The study also shows some evidence of an

increased risk from rectal cancer. It has been suggested that rectal cancer might be associated¹⁰ with heavy beer consumption, and it is possible to hypothesise that a dusty occupation may encourage this. The overall SMR for cancer of the oesophagus, however, also associated with high alcohol consumption,¹⁰ is not appreciably raised (116 on 3 deaths), and no deaths were reported from cirrhosis of the liver.

Nasal cancer has been shown to be dust related,¹⁰ although the evidence suggests that organic dust as the primary risk. No deaths from this cancer were recorded in the study.

The study does not support a hypothesis of a relation between exposure to cement dust and mortality from respiratory disease since low SMRs are found for all respiratory diseases (86) and for bronchitis, emphysema, and asthma (78). It has been suggested, however, that the conjunction of smoking and exposure to cement dust is necessary to produce severe respiratory impairment.² The relatively low SMR for lung cancer (85 on 28 deaths) suggests that overall, this group of workers were not heavy smokers, and may thus partly explain the low mortality from respiratory disease. The figures for the occupational groups show no clear pattern for respiratory disease although the SMRs tend to be higher for the groups of labourers.

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