

TABLE 3

Deaths among 17,800 asbestos insulation workers in the United States and Canada January 1, 1967-January 1, 1977: Analysis by duration from onset of employment

Total men Man-years of observation	12,683 89,466	12,051 77,389
	Before 20 years from onset	20 or more years from onset
	Expected* Observed	Expected* Observed
Total deaths, all causes	283.93 324	1,377.01 1,946
Cancer, all sites	42.65 83	277.25 911
Lung cancer	12.03 36	83.94 449
Pleural mesothelioma	** 2	** 64
Peritoneal mesothelioma	** 3	** 106
Cancer of esophagus	0.66 1	6.35 17
Cancer of stomach	1.56 1	12.67 21
Cancer of colon-rectum	4.07 4	33.79 55
Asbestosis	** 8	— 154

* Expected deaths are based upon white male age specific mortality data of the U.S. National Center for Health Statistics for 1967-1975 and extrapolation to 1976.

** These are rare causes of death in the general population.

tween 1964 and 1971, with radiologically evident pleural plaques; these plaques were considered to signal prior shipyard employment. Controls were 429 men from a neighboring city (Carlisle), matched for age and date of X-ray; they had no plaques on their roentgenograms. Both groups were observed through 1976, i.e., for a minimum of five years. Among the 429 men with pleural plaques, there were 127 deaths; those with no plaques suffered 74 deaths. The excess was primarily in two categories, lung cancer and mesothelioma. There were 19 deaths from lung cancer and 23 from mesothelioma among the

former shipyard workers. As for the controls, four died of lung cancer and none died of mesothelioma.

Findings of an extraordinary increase of mesothelioma were also reported last year from the French shipyard area in Western Brittany. Lajarte et al. analyzed cases of pleural mesothelioma in Nantes. In the period 1957-63, there were two cases; from 1964-1970 there were 12; and from 1971-1974 there were 24.¹² This was interpreted as consistent with the markedly increased shipbuilding program during and after World War II, and with its attendant risk of asbestos exposure.

TABLE 4
Deaths among 17,800 asbestos insulation workers in the United States and Canada, Jan. 1, 1967-Jan. 1, 1977: Analysis by duration from onset of employment

Duration from onset (years)	Number of men	Person-years of observation	Lung cancer		Pleural mesothelioma No./1000 person-years	Peritoneal mesothelioma No./1000 person-years
			Expected*	Observed		
<10	5,552	26,393	0.69	0	0	0
10-14	9,083	29,003	2.77	7	0	0
15-19	9,948	34,069	8.57	29	0.06	0.09
20-24	8,887	31,269	17.03	59	0.19	0.10
25-29	6,596	20,657	21.04	104	0.73	0.87
30-34	3,547	11,598	18.48	112	0.86	1.90
35-39	2,019	5,401	11.47	66	2.96	3.33
40-44	1,108	3,160	8.12	39	1.27	5.06
45+	1,030	5,305	17.82	69	2.45	5.47

* Expected deaths are based upon white male age specific mortality data of the U.S. National Center for Health Statistics for 1967-1975 and extrapolation to 1976: Smoking habits not taken into account.

ASBESTOS DISEASE IN U.S. SHIPYARDS

There has been comparatively little written concerning the potential for asbestos-disease hazards in U.S. shipyards. In part, this may have been due to the fact that in the latter part of World War II a survey directed to this question failed to demonstrate the prevalence of significant asbestos disease. At that time, 1,074 insulation workers employed in U.S. yards were examined and, with few exceptions, no evidence of disease was found.¹³ Unfortunately, the significance of the fact that the very large majority of men had begun working only a short time before was not appreciated; neither was it understood that X-ray evidence of disease could not be expected to appear until one or two decades later.

During the 1960's, evidence accumulated that "asbestos workers" (insulation)

employed in shipyards had unhappy disease experience, with markedly increased death rates of cancer (lung cancer, pleural mesothelioma, peritoneal mesothelioma, gastrointestinal cancer) and asbestosis.¹⁴ These observations, however, were confined to insulation workers, and while they pointed to a possible accompanying difficulty among other shipyard trades, especially in view of British experience, detailed observations concerning other workers were not available.

The potential for asbestos disease in U.S. shipyards was further highlighted by accumulating knowledge that the workers who manufactured the asbestos insulation materials used in U.S. yards during and after World War II were themselves found to suffer serious asbestos disease. Investigations of the employees at one such plant showed markedly increased risk of neoplastic disease and asbestosis, including increased risk of death of cancer with as little as one month of employment.^{15, 16}